(9) OPERATIONS ANALYSIS REPORT.

(10) (1)

(6) A SHORT SURVEY OF JAPANESE RADAR. VOLUME II.

(11) 20 November 1945

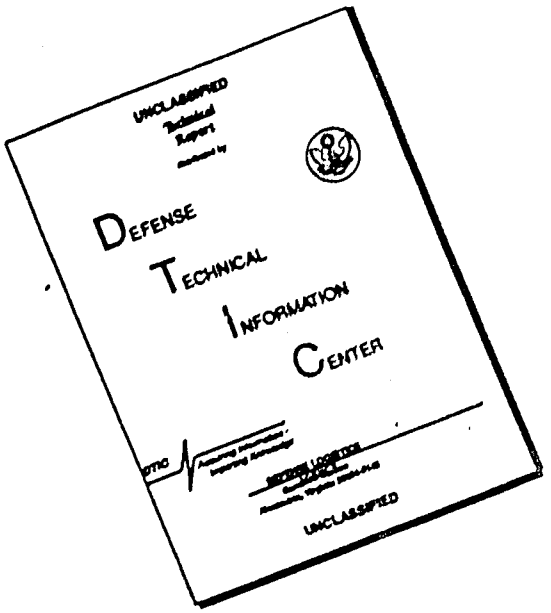
(12) 130 p.

Prepared by
2d & 3d Operations Analysis Section, FEAF
and
Air Technical Intelligence Group, FEAF
(ATIG Report No. 115)

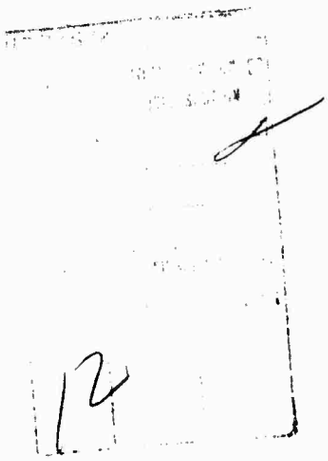
NOTE: This report does not necessarily represent the views of either Headquarters, Army Air Forces or the Headquarters through which it was issued.

Distributed by
OPERATIONS ANALYSIS, AC/AS-3
Headquarters, Army Air Forces
Washington 25, D. C.

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.



A SHORT SURVEY OF JAPANESE RADAR

Volume II

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

IV - JAPANESE ARMY RADARS--EQUIPMENT MANUFACTURED AND PLANNED

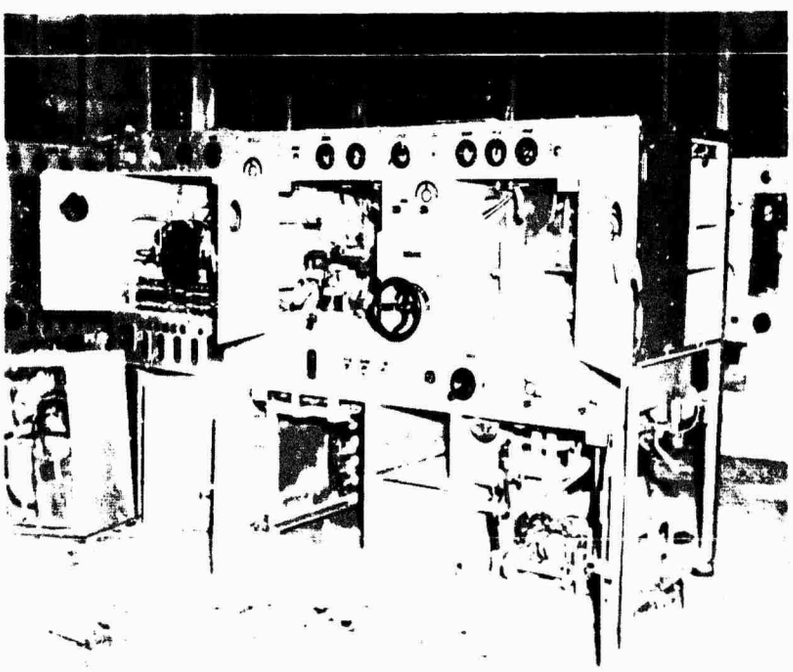
1. General. In this section of the Survey are given brief reviews of each of the Japanese Army radar sets of any importance. (Similar data are given in Section V on Japanese Navy sets.) Many were still in the developmental, or even planning, stage. These are included with the thought that they may on that account be of even greater interest since they tend to point out the extent of the art and thinking in Japanese electronic circles. The data have all been supplied by Japanese war research or manufacturing agencies. In some cases slightly conflicting information will be noted. These have been left as reported since the discrepancies did not appear of sufficient importance to warrant expending the time to resolve them.

The block diagrams of army sets were drawn up to comply with the directive of General Headquarters, U.S. Army Forces in the Far East, to disclose all of their radar equipments, research work, and proposed developments. Most of these diagrams were drawn in pencil on rough paper. Reproduction is therefore not perfect but it is believed adequate for ordinary study purposes. Numerous oddities of spelling and notation have been left untouched (except where difficulty in meaning was present).

With each block diagram have been inserted one or more pages summarizing the technical characteristics of each equipment. Wherever possible close up pictures are shown which assist in describing its construction or operation. Only new pictures taken on the home islands of Japan (mostly in the Tokyo area) are included, on the assumption that pictures taken of earlier captured Japanese sets will, in the main, be familiar to the reader. In some cases suitable pictures or studies could not be made because the Japanese had partly destroyed the units; othertimes, and much more often, our own occupying forces had either gone "souvenir hunting" or engaged in the fun of smashing delicate instruments, and defaced certain sets almost beyond recognition. An example of this is shown in the accompanying photos in some of the buildings at the main Army Radar School near Tachikawa. A small number of sets were installed at such remote points that photographing would have been quite difficult. Some of these will yet be visited by subsequent radar investigators who will undoubtedly make their pictures available in later reports.

2. Type A vs Type B Systems. The Japanese Army used both Type A (Doppler) and Type B (pulsed) radar systems. A network of A-nets girdled the shores of the home islands as seen in the maps of Section VIII. The navy had plans for A-type sets also but did not employ them. The A-sets depend on the Doppler effect or wave interference patterns set up when a moving reflector, e.g. an airplane, crosses the transmission path between a transmitter and a receiver. This section of the Survey will concern itself exclusively with Type B sets.

The U. S. Army stripped this Japanese radar equipment -- for souvenirs or for unaccounted reasons. (Japanese Radar School at Kodaira.)



3. "The Japanese Army Radar Book". The information and block diagrams for the army radar sets were supplied principally by members of the Tama Radar Research Institute. Certain data, however, are from manufacturers and other sources.

It may be observed that Tachi- and similar designations are Tama Laboratory numbers and frequently do not appear on the name plates of the equipment. They are used here because they are convenient, are recognized by the laboratories, the manufacturers and the operators, and because they give information on the use to which the set will be put. Thus:

Tachi is used for ground equipment.
Tase is used for shipborne equipment.
Taki is used for airborne equipment.

A "Radio Detector" is a search radar.

A "Radio Locator" is an accurate positioning radar. Searchlight control, gunlaying and GCI radars fall in this class.

A "Radio Leader" is a set used to furnish accurate information on the position of a friendly fighter. With a locator it makes up a GCI station.

A "Wave Counter Measuring Apparatus" is an RCM search receiver. A "Disturber" is a jammer.

PRESENT STATUS OF JAPANESE ARMY RADAR EQUIPMENT

15 August 1945 Survey

NAME	CLASSIFICATION			CODE NAME	OBJECTIVE	CAPABILITIES	WEIGHT	STATUS OF PROGRESS AS OF 15 AUGUST 1945	MANUFACTURED BY	NUMBER PRODUCED
WARNING RADAR	GROUND		A (W) (1kW) Transmitter (100W) (400W)	-----	"Doppler" Warning System	Antiaircraft Warning - Range 20-300 Km	100 Kg-2 tons	Research and Test Completed In Use	Tokyo Shibaura Communication and several other companies	
			B (Permanent)	Tachi Mk 6	Permanently built at important bases. Detects and computes the position of approaching aircraft.	f = 68, 72, 80 MC/S. Maximum power output 50 KW. Anti-aircraft warning range 300 Km. Range accuracy ± 7 KM. Azimuth accuracy ± 5°	10 tons	Research and Test Completed Most of preparation to send specialist out to the bases to make further research. Research ees being made to improve accuracy of range and azimuth.	Sumitomo Communications.	350
			B (Field)	Tachi Mk 7	Mounted on vehicles to facilitate its use in detecting and computing the position of approaching aircraft.	f = 100 MC/S 50 KW Range 300 Km Range accuracy ± 5 KM Azimuth accuracy ± 5°	18 tons (includes vehicles)	Research and test completed. In use.	Iwasaki Communications.	60
			B (Portable)	Tachi Mk 18	Equipment transportable by trucks. Detects and computes the position of approaching aircraft.	f = 94, 98, 102, 106 MC/S. 50 KW. Range 300 KM. Range accuracy ± 5 KM. Azimuth accuracy ± 5°	4 tons	Research and test completed. In use.	Tokyo Shibaura and Iwasaki Communications	400
			Altitude Calculator	Tachi Mk 35	Accurately locates the position of the aircraft and computes the altitude.	f = 82 MC/S. 50 KW. Range 100 KM Range accuracy ± 1 KM Azimuth accuracy ± 1° Elevation accuracy ± 500 M	4 tons	Research completed, test completed and 3 sets in actual use. (Matsudo, Kowegadani, Gozenyama).	Sumitomo Communications.	3
			Altitude Calculator with Receiver Attachment	Tachi Mk 20	Attached to the receiver of the permanent warning rader. Computes the altitude of aircraft at long range.	f = 68, 72, 76, 80 MC/S. Range 100 KM Range accuracy ± 1 KM Azimuth accuracy ± 1° Elevation accuracy ± 500 M	2 tons	Research and test completed. Five sets in use (Choshi, Shimoosa, Shirahama).	Asahi Electric.	12
	SHIP		B (Ship)	Tase Mk 1	Used on ships. Detects and computes the position of approaching aircraft.	f = 110 MC/S. 50 KW. Range 300 KM Range accuracy ± 5 KM Azimut. accuracy ± 7°	4 tons	Research completed. Results unsatisfactory in actual use. Plans being formulated to transfer its use on land.	Tokyo Shibaura Communications.	30
			Transport Sub	Tase Mk 10	Used on transport subs for aircraft protection.	f = 150 MC/S. 10 KW. Range 50 KM Range accuracy ± 3 KM non-directive.	100 KG (Aerial not included)	Research completed. Suspended emergency production. Test incomplete due to inadequacy of electrical equipment on sub.	Tokyo Shibaura Communications.	1
			Anti-sub	Tase Mk 2	Used on ships to detect and compute the position of ships and subs.	Wavelength = 15.7 CM 1 KW. Range against ships 50 KM Range against subs 15 KM Range accuracy ± 100 M Azimuth accuracy ± 1°	2 tons	Research completed. Results were unsatisfactory in actual use. Modified and installed 2000 vessels as short warning radar.	Tokyo Shibaura Communications and Nippon Wireless.	60
	A/C	Anti-ship	Model II	Taki Mk 1	Used on large type aircraft to detect and compute positions of ships and subs.	f = 150 MC/S. 10 KW. Range against ships 100 KM Range against subs 20 KM	Model II 110 KG.	Research and tests completed. In use.	Nippon Wireless.	
		Anti-sub	Model IV		Smaller type but same capabilities as Model II.	Range accuracy ± 2 KM Azimuth accuracy ± 5°	Model IV 60 KG.	Research completed. Test model being made.	Tokyo Shibaura Communications.	
LOCATING RADAR	GROUND		Model 1	Tachi Mk 1	Set up at important bases. Fixes firing data for anti-aircraft guns.	f = 200 MC/S. 10 KW. Locating range 30 KM Range accuracy ±100 M Azimuth accuracy ±1° Elevation accuracy ± 2-3°	8.5 tons	Research completed. Produces 30 sets, production was suspended. Plans were being made for Model IV modification with transmitter and modulator to increase range and stability.	Jamming 1. Window. Evasion was carried out by dropping the "Chaff" method but our units did not suffer difficulties in actual use. 2. Electrical Jamming. Evasion electrical jamming from aircraft by use of 3 wavelengths.	Shibaura Communications.	30
			Model 2	Tachi Mk 2	Same as above.	f = 200 MC/S. 10 KW. Range 20 KM. Range accuracy ±100 M Azimuth accuracy ±1° Elevation accuracy ±1°	2.5 tons	Research completed. Produces 30 sets production suspended, more than one-half rejected. None in use.		Tokyo Shibaura Electron Research	30
			Model 3	Tachi Mk 3	Improvement over Model 1 and 2 with increased power output and higher degree of stability.	f = 150 MC/S. 50 KW. Range 40 KM. Range accuracy ± 100 M. Azimuth accuracy ±1° Elevation accuracy ±1°	4 tons	Research completed. Emergency production suspended. In use. Simple improvement was made which facilitates the adjustment of the altitude coverage.		Sumitomo Communications.	150
			Model 4	Tachi Mk 4	Improvement over Model 1 and 2 with simplified construction.	f = 200 MC/S. 10 KW. Range 40 KM. Range accuracy ± 100 M. Azimuth accuracy ±1° Elevation accuracy ±1°	2.5 tons	Research completed. Emergency production suspended. None in use. Simplification and receiver combined to simplify assembly.		Tokyo Shibaura Electron Research	50
			Model 4 Modification.	Tachi Mk 31	Improvement made over Models 1, 2 and 4. Will be the standard model for locator radar.	f = 200 MC/S. 10 KW. Range 40 KM. Range accuracy ± 100 M. Azimuth accuracy ±1° Elevation accuracy ±1°	2.5 tons	Research completed. In emergency production now, but research is being made in improving the antenna.		Fuji Electric.	70
			Wurzburg	Tachi Mk 4	Copied the standard German model Wurzburg D for the purpose of reducing the wavelength and improving the azimuth accuracy.	Wavelength = 50 CM. 10 KW. Range 40 KM. Range accuracy ±40 M. Azimuth accuracy ±1/6° Elevation accuracy ±1°	1.5 tons	Research completed. Under preparation for production. Research being made to improve the stability and capabilities.	Nippon Wireless.	1
	A/C	Anti-aircraft (Anti-ship)	Model II	Taki Mk 2	Principally used during the night on fighter aircraft to approach ships and aircraft.	Wavelength = 50 CM. 2 KW. Range 3 KM against aircraft. Range 7 KM against ships. Range accuracy ±200 M. Azimuth accuracy ±1°	120 KG.	Research completed. Under actual test. Under emergency production.	Sumitomo Communications.	
			Model III		Improvement made on the indicator of Model II.		Unknown	Research on the indicator completed. Under preparation for actual test.		
OFFENSIVE FIGHTER A/C DIRECTING RADAR	FOR SINGLE A/C		Ground Section	Taoni Mk 13	Set up at fighter bases. Used together with aircraft relay equipment (Taki 15) to compute the position of the friendly aircraft.	Transmitter f = 144 MC/S. Receiver f = 175 MC/S. 10KW Range 150 KM. Range accuracy ± 100 M. Azimuth accuracy ±1°	1.5 tons	Research and test completed. Technical instruction are given to units using equipment.	Tokyo Shibaura Communications.	20
			Aircraft Section - Model I.	Taki Mk 15	Equipment on friendly fighter aircraft. Automatically relays electric impulse from ground.	Receiver f = 144 MC/S. Transmitter f = 175 MC/S. 100 W. Non-directive.	20 KG.	Same as above.	Tokyo Shibaura Communications.	50
	FOR SEVERAL A/C		Ground Section	Taoni Mk 28	Deployed around fighter base area and computes the position of friendly aircraft by central converging method.	f = 150 MC/S. Range 300 KM. Range accuracy ± 1 KM. Azimuth accuracy ± 1°. Signal relay f = 50-65 MC/S.	400 tons	Research completed. Under actual test. Under preparation to use equipment immediately for completion of test.	Kokusai and Fuji Communications.	1
			Aircraft Section.	Taki Mk 30	Transmitter equipment on friendly aircraft used in conjunction with Taoni Mk 28.	Transmitter f = 140 MC/S. 1 W. 20 C. Modulation f = 50-60 KC/S. 11 KC/S step). Non-directive.	25 KG.	Same as above.	Shibaura Electric.	50
	DIRECTING EQUIPMENT		Computer	Taoni Mk 4A	Computes the bearing and range of the future position of friendly and enemy aircraft from data gathered from locator and tracking radars.	Accuracy of computation: bearing ±1° Range ± 100 m. ± evil.	80 KG.	Test model Mk 1 was tested in Hamamatsu area, but inaccurate, no tests. Further work Mk 2.	Tokyo Electric.	2
			Transmitter		Transmits the data to the aircraft.	Accuracy of transmission: bearing ±1° Range ± 200 M. Altitude ± 100 M.	100 KG.	Same data sheets as Mk 1 were used in actual use.	Fujitsu and Shibaura.	
			Indicator		Indicates the position of friendly and enemy aircraft on the screen.		40 KG.	Testing and manufacturing company unknown. Under preparation for actual use.	Fujitsu and Shibaura.	
	Ground Section		Model I	Taoni Mk 17	Installed together with warning radar. Carries out identification of friendly or foe in conjunction with the relay equipment on the aircraft.	Transmitter f = 144 MC/S. Receiver f = 175 MC/S. 10 KW. Range 50 KM. Range accuracy ± 1 KM. Azimuth accuracy ±1°.	1.5 tons	Research completed. Under test use.	Shibaura and Fujitsu.	50
			Model II		Improvement over Model I with modification made on aerial.	Range 250 KM. Range accuracy ± 1 KM.	1.5 tons	Same test made, the long aerial	Research and	

					length and improving the azimuth accuracy.	Azimuth accuracy ±1/8° Elevation accuracy ±1/80		proves the stability and capabilities.		
	A/C	Anti-aircraft (Anti-ship)	Model II	Taki Mk 2	Principally used during the night on fighter aircraft to approach ships and aircraft.	Wavelength = 80 CM. 2 KW. Range 3 KM against aircraft. Range 8 KM against ships. Range accuracy ±200 M. Azimuth accuracy ±1°	120 KG.	Research completed. Under actual test. Under emergency production.	Sumitomo Communications.	
			Model III		Improvement made on the indicator of Model II.		Unknown	Research on the Indicator completed. Under preparation for actual test.		
LEADING RADAR	OFFENSIVE FIGHTER A/C DIRECTING	DIRECTING EQUIPMENT FOR SINGLE A/C	Ground Section	Taohi Mk 13	Set up at fighter bases. Used together with aircraft relay equipment (Taki 15) to compute the position of the friendly aircraft.	Transmitter f = 184 MC/S. Receiver f = 175 MC/S. 10KW Range 150 KM. Range accuracy ± 500 M. Azimuth accuracy ± 1°	1.5 tons	Research and test completed. Technical instruction was given to units using equipment.	Tokyo Shibaura Communications.	20
			Aircraft Section - Model I.	Taki Mk 15	Equipment on friendly fighter aircraft, automatically relays electric impulse from ground.	Receiver f = 184 MC/S. Transmitter f = 175 MC/S. 100 W. Non-directive.	25 KG.	Same as above.	Tokyo Shibaura Communications.	50
		DIRECTING EQUIPMENT FOR SEVERAL A/C	Ground Section	Taohi Mk 28	Deployed around fighter base area and computes the position of friendly aircraft by central converging method.	f = 190 MC/S. Range 300 KM. Range accuracy ± 1 KM. Azimuth accuracy ± 0.5° Signal relay f = 50-65 MC/S. 8 W.	500 tons	Research completed. Under actual test. Under preparation to use equipment immediately upon completion of test.	Kokusai and Fuji Communications.	1
			Aircraft Section.	Taki Mk 30	Transmitter equipment on friendly aircraft used in conjunction with Taohi Mk 28.	Transmitter f = 190 MC/S. C.W. 20 W. Modulation f = 30-60 KC/S. (1 KC/S step). Non-directive.	25 KG.	Same as above.	Mitsubishi Electric.	50
			Computer	Taohi Mk 46	Computes the bearing and range of the future position of friendly and enemy aircraft from data gathered from locator and leading radars.	Accuracy of computation: Bearing ±2° Range ± (30 sec. x cruising speed).	40 KG.	Test Model Mk 1 was lost in the incendiary raid, but carrying on tests at Fujigadani with Mk 2.	Yokoga Electric.	0
			Transmitter		Transmits the above data to the aircraft.	Accuracy of transmission: Bearing ±5 Range ± 200 M. Altitude ± 500 M.	20 KG.	Completed tests on three models. Not in actual use.	Sumitomo Communications.	
			Indicator		Indicates the position of friendly and enemy aircraft on the screen.		500 KG.	Testing and manufacturing company burned. Research temporarily suspended.	Sumitomo Communications.	
IFF		Ground Section	Model I	Taohi Mk 17	Installed together with warning radar. Carries out identification of friend or foe in conjunction with the relay equipment on the aircraft.	Transmitter f = 184 MC/S. Receiver f = 175 MC/S. 10 KW. Range 250 KM. Range accuracy ± 3 KM. Azimuth accuracy ± 3°.	1.5 tons	Research completed. Not in practical use.	Mitsubishi Electric.	50
			Model II		Improvement over Model I with modification made on sensitivity.	Range 450 KM. Range accuracy ± 2KM. Azimuth accuracy ±1°.	1.6 tons	Equipment using the inter-sectioning principle was under test.	Iwasaki Communications.	
		Aircraft Section	Model II	Taki Mk 15	Installed on friendly aircraft and works together with Taohi Mk 17.	Transmitter f = 175 MC/S.100W. Receiver f = 184 MC/S. Non-directive.	25 KG.	Research and test completed. Under preparation for practical use.	Mitsubishi Electric.	180
			Model III		Combination of Models I and II.		25 KG.	Test model completed. Preparation made for field test.	Tokyo Shibaura Communications and Adachi Electric.	
NAVIGATION EQUIPMENT	TWO CURVED LINE NAVIGATION EQUIPMENT	Ground Section		Taohi Mk 39	Two curved lines used for navigation. Is computed from the phase difference of impulses transmitted from two stations.	f = 1.5 MC/S. 150 KW. Range during day 900 KM-night 7000 KM. Range accuracy ±1%.	600 tons	Partially completed. Some equipment at the eastern section but was destroyed by fire from incendiary bomb.	Sumitomo Communications.	
		Aircraft Section		Taki Mk 39	Same as above - aircraft section.	f = 1.5 MC/S. Non-directive.	50 KG.	Started training on a training model.	Nippon Wireless.	
	NIGHT RADAR	Model 1		Taki Mk 14	Installed on aircraft. Identifies the condition of terrain and during the night and from above the clouds. Used for navigation and landing.	Wavelength = 27 CM. 3 KW. Range in cruise 30 KM. (5000 M altitude). Range accuracy ± 3 CM. Azimuth accuracy ± 3°. PPI display.	100 KG.	Research completed. Carrying on preparation for test. Aircraft with was planned for the equipment was damaged by bomb. Repairs in aircraft almost complete.	Tokyo Shibaura Communications.	
		Model 2			Improvement over Model 1. Planned to use at high altitudes.		Unknown	General research completed. Making test model.	Tokyo Shibaura Communications.	
	RADAR ALTIMETER	For High Altitudes.		Taki Mk 11	Installed on aircraft. Computes the distance to the ground from high altitude.	Wavelength = 80 CM. 200 W. Range 10,000-200 M. Error 10%.	25 KG.	Research and test completed. Some in practical use.	Tokyo Wireless and Kawasaki Machinery.	
		For Low Altitudes.	Model I	Taki Mk 1*	Computes distance to ground from low altitudes.	Wavelength = 80 CM. Continuous power output 4W. Frequency modulation 15 MC/S. Range 150-20 M. Error ±5%.	25 KG.	Research and test completed. In use.	Tokyo Shibaura Communications.	
			Model II		Improvement over Model I with a stabilizer.		25 KG.	Research completed. Preparation under way for test.	Tokyo Shibaura Communications.	
DETECTOR RADAR	A/C		A	Taki Mk 4	Used in detecting the wavelengths of radars and has the capability of bearing.	Wavelength = 7-15 M. Main 100 dt. Range 250 KM. Accuracy of wavelength computation ±1%.	150 KG.	Research completed. Further research in order to improve the capabilities.	Toyo Communications.	
			B	Taki Mk 5	Has capabilities of determining direction.	Wavelength = 4-1.5 M. Main 120 dt. Range 400 KM. Accuracy of wavelength computation ±1%. Accuracy of determining direction ± 5° at 200 KM.	60 KG.	Research completed. Production furnished with 30 radars. Training the units in the field.	Toyo Communications.	
		Ground		Taohi Mk 6	A simple detecting radar.	Wavelength = 7 - 0.5 M. Main 4110 dt. Range 200 KM. Accuracy of wavelength computation ± 1%	12 KG.	Research and test completed. Training the units in the field.	Toyo Communications.	
		Ground		Taohi Mk 10		Wavelength = 70-3 CM. Main 40 dt. Crystal detector. Accuracy of direction ± °. Range 60 KM.	50 KG.	Research and test completed. Training the units in the field.	Nuno Electron Industry.	
RADAR JAMMING		Aircraft		Taki Mk 8	Has capabilities of jamming radars.	Wavelength = 3-1.5 M. Continuous 10 W. Impulse 1 KW. Automatic and manual dynamic tuner.	100 KG.	Research completed. Equipped 17 units. Training the units in the field.	Nippon Wireless.	
				Taki Mk 12	Same as above.	Wavelength = 1.5-0.8 M. Continuous 10 W. Impulse 30 W. Automatic or manual dynamic tuner.	100 KG.	Research completed. Taking test model 2 on.	Mitsubishi Electric.	
SPECIAL EQUIPMENT	3 axial Aircraft Control (3 A)		Ground Section	Taohi Mk 20	A locator or an instrument that guides sliders following the sensitivity lines of special radar waves.	f = 200 MC/S. Accuracy of direction ± °. Partly modified version of Model 4 locator.	2.4 tons	Basic research nearly completed. General form of 4 finished. Plans being drawn for test finish. Research going on compatibility of performance for 200 M/S thrust if 4	Toyo Electric Research Institute Electric.	
			Aircraft Section	Taki Mk 200		f = 200 MC/S. Jointly to control of course indicator planned.	12 KG.			
	ANTI SHIP ARMED WITH EQUIPMENT	For Ships		Taki Mk 100	Detects and alarms to electric waves sent from ships and a torpedo fitted with radar material (method of detecting equal sensitiveness).	Wavelength = 4.5-3.5 M. Effective distance 5 KM. Indicator of Taki Mk 5 emitted and auto control device attached.	Undetermined	Under research.	Toyo Communications Electric.	
		For Aircraft		Taki Mk 50	Detects reflected waves from ships and a torpedo to these waves. A guided detecting method.	f = 900 MC/S. Continuous output 70 W. Effective distance 5 KM expected.	Undetermined	Under research	Mitsubishi Electric. Planned but will not be carried out.	

TACHI - 6

RADIO DETECTOR FIXED TYPE

Corresponding Allied Designation: Chi-B (F).

Technical Characteristics:

f = 68, 72, 80 MC/S. 50 KW. Range 300 Km.
Accuracy: Range, ± 7 Km; Azimuth, ± 5°.

Number Built = 350. Approximate Number Installed = MANY

Description:

This is the set on which the main Japanese reliance was placed for early warning. These equipments were called Yochi Yo Dempa Keikaik, or "Radio Detector for the Important Place," and as seen on the radar disposition maps in Section VII dotted the southern shores of the home islands. They were also built on several islands in the chains leading southward from Japan, the installations becoming less elaborate as the distances increased to such points as Okinawa and the Philippines.

A Tachi-6 installation usually comprised one transmitter which radiated in all directions at once, or at least in a 90° sector, and from 3 to 6 receivers spaced in a roughly circular pattern about it at distances up to several hundred yards. At the major reporting station at Choshi, 75 kilometers east of Tokyo, two complete Tachi-6 units were set up; the transmitters were located on a small hill about a mile from the ocean with some 8 receiving stations oriented in all directions about them.

The fixed transmitting antennas took various forms, usually supported on a single very tall pole. Four layers of horizontally polarized antennas were always used. For a 90° sector an antenna similar to the one shown in the block diagram was used. For an all round sending station a four sided "box-kite" was built encircling the pole.

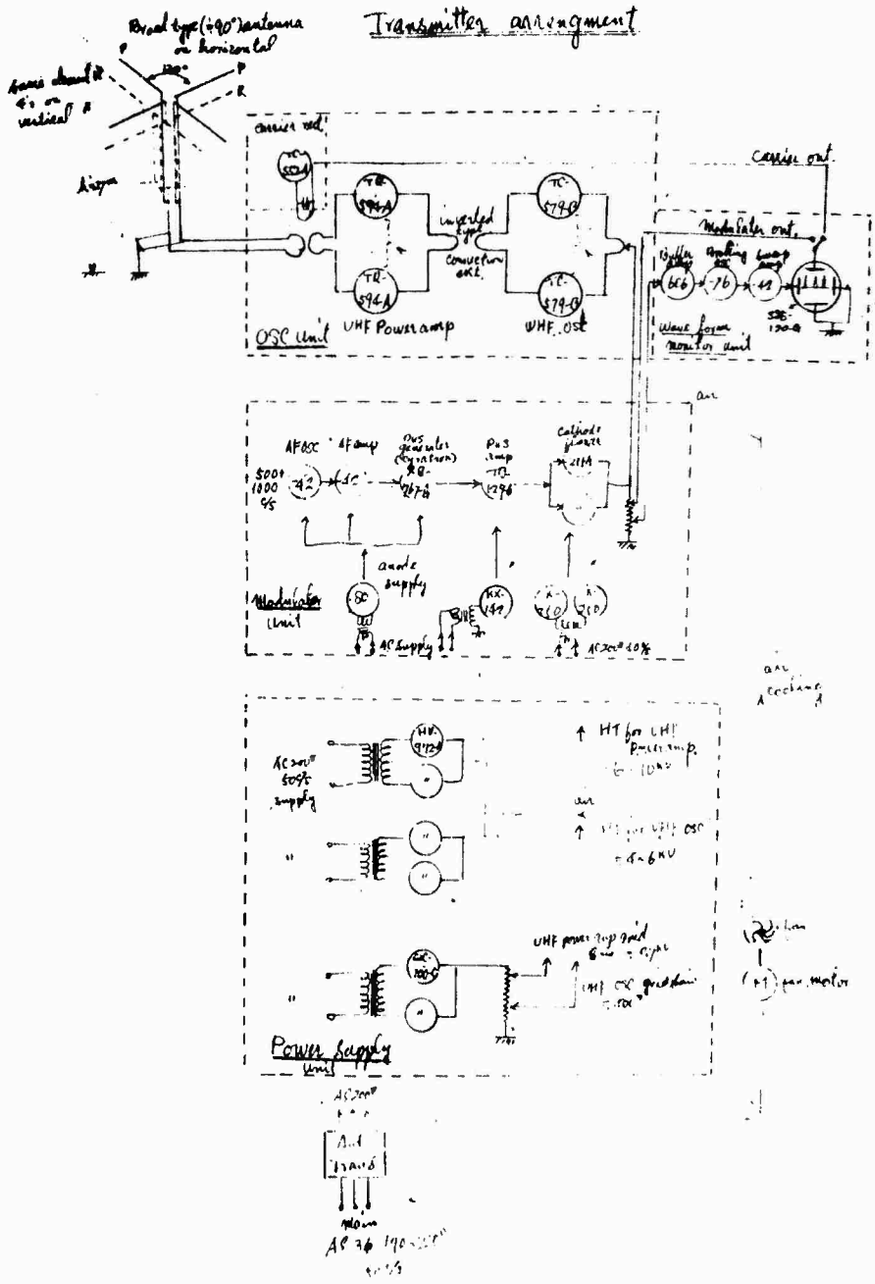
The receiving antennas which were hand rotated on a heavy central column usually extending down through the building housing the receiver equipment are of the type shown in the photograph. In operation one or more receivers are assigned a certain search sector. Thus searching a sector continues while one antenna tracks a flight. Display is on an A-scope reading 0-150 km or 0-300 km.

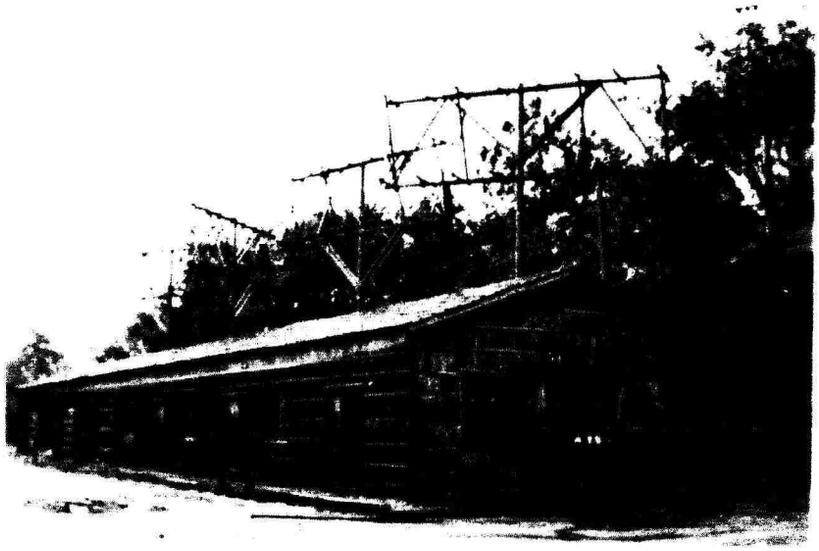
An auxiliary receiver picks up the pulse from the transmitter and uses it for sweep synchronization purposes.

Additional receivers may be located at points 20 km or more away to supply early warning information to AAA units, which "see" the aircraft by the illumination of the one transmitter unit. Such units use special elliptical charts to plot the position of a flight. One such installation was in use by a series of 8 AA and S/L headquarters receivers located in positions up to 20 km from the Tachi-6 transmitter at Ikuta west of Tokyo.

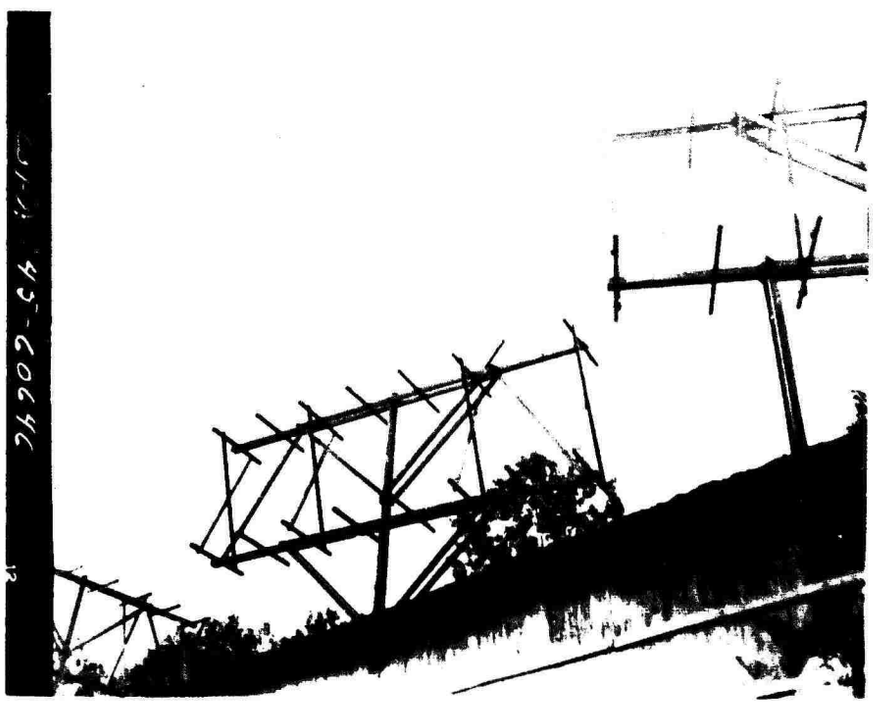
Radio detector fixed type (TACHI-6)

Transmitter arrangement

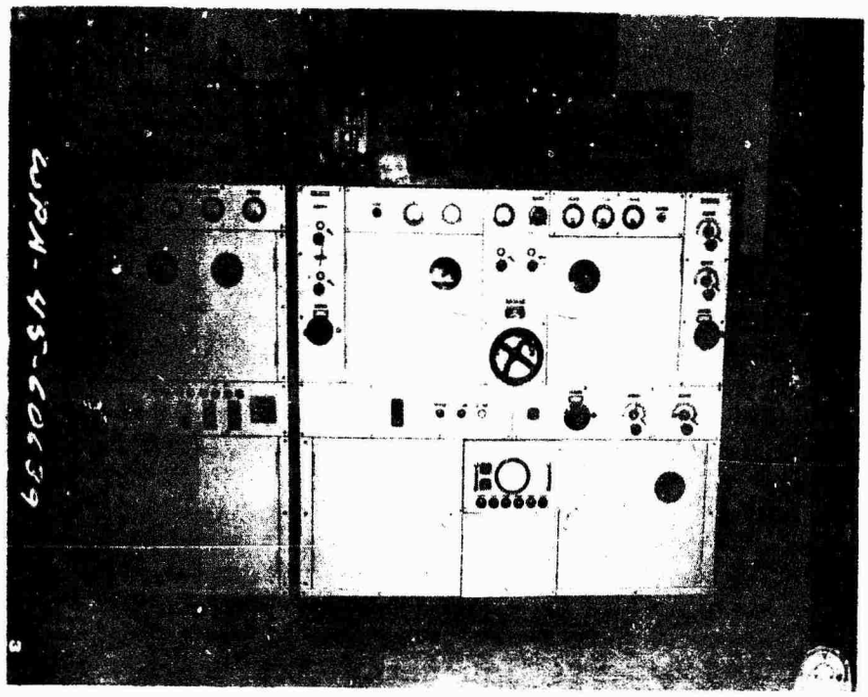




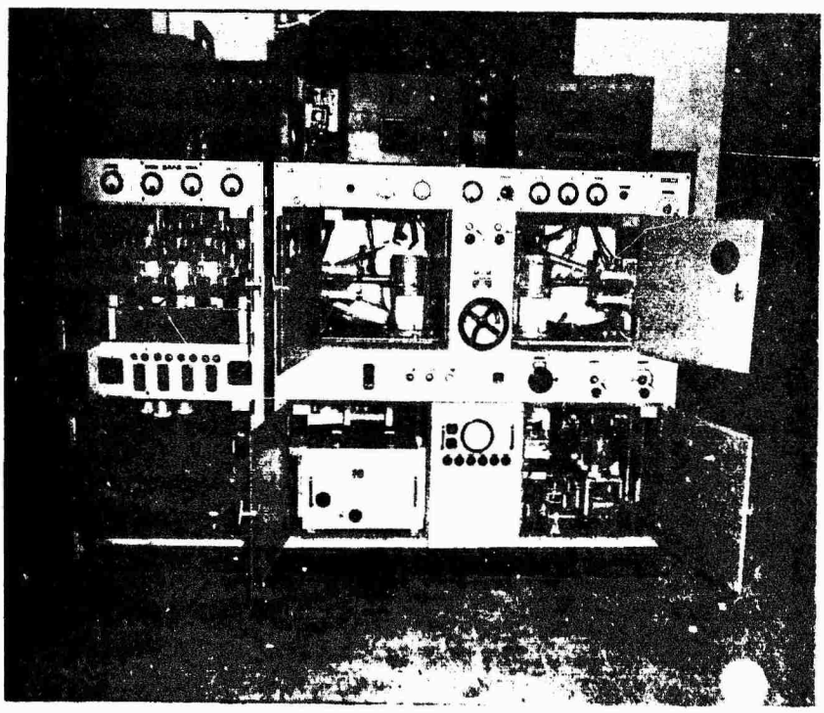
A Group of Tachi-6 Receiving Antennas at the Army Radar School - Kodaira.



Close up of a Tachi-6 Receiving Antenna.

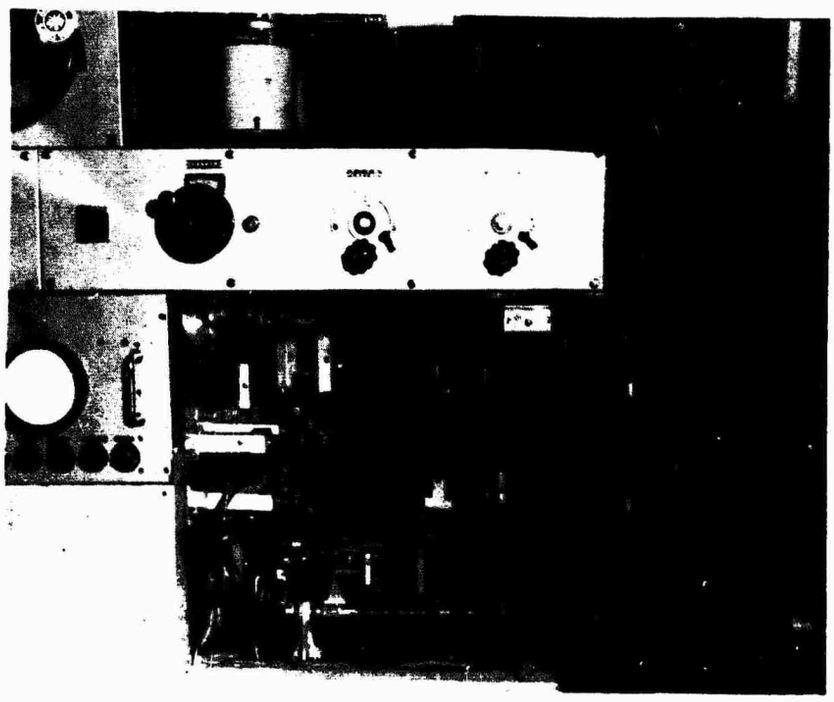


Transmitter and Power Units of Tachi-6.



Interior View of Transmitter and Power Units of Tachi-6.

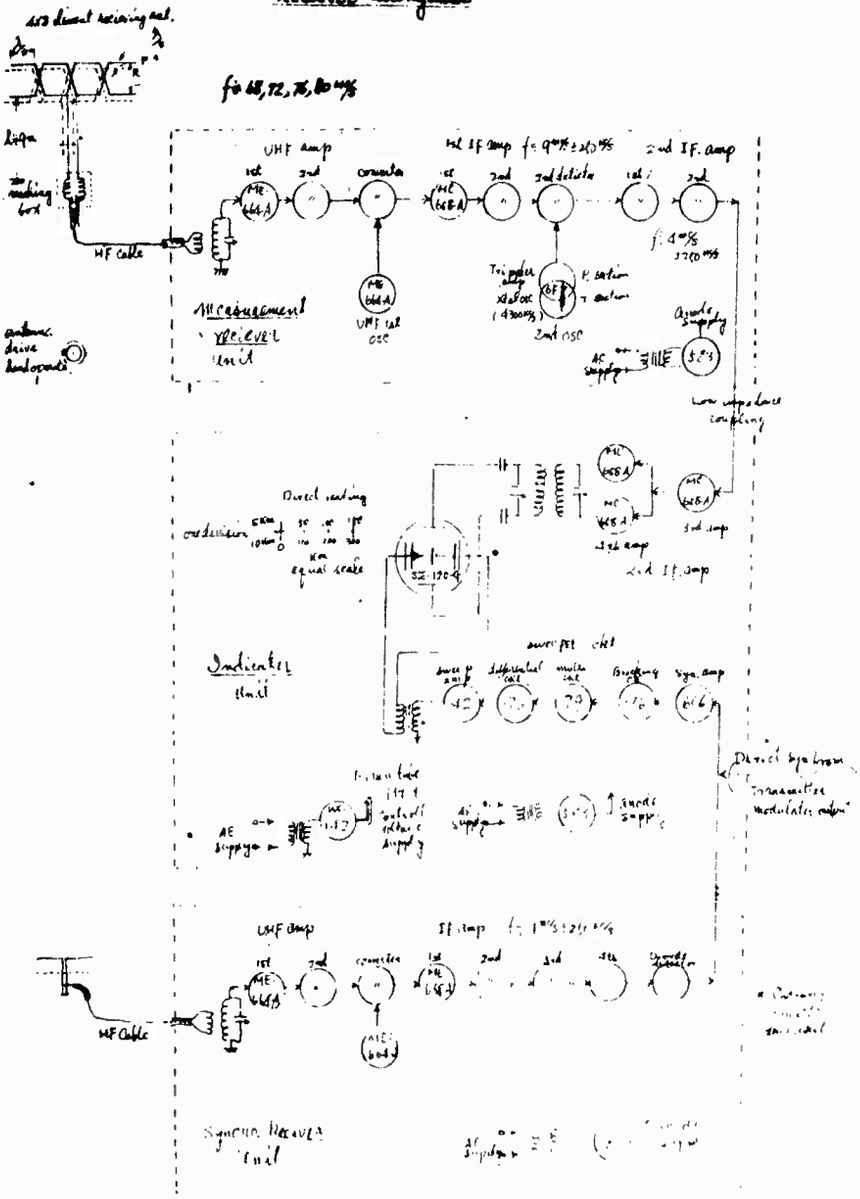
Detail of Transmitter Section - Tachi-6.

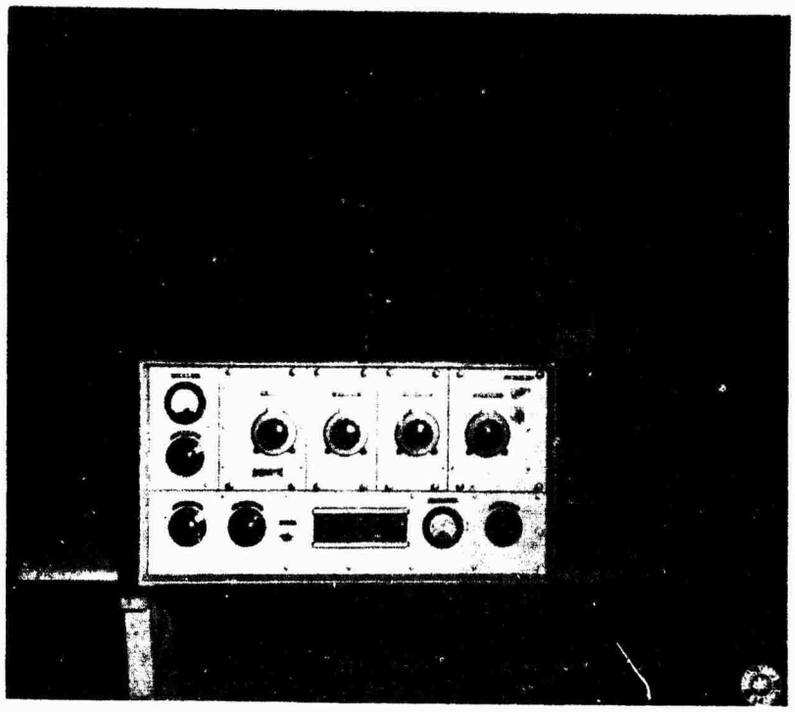


Detail of Oscillator Adjust Compartment - Tachi-6.

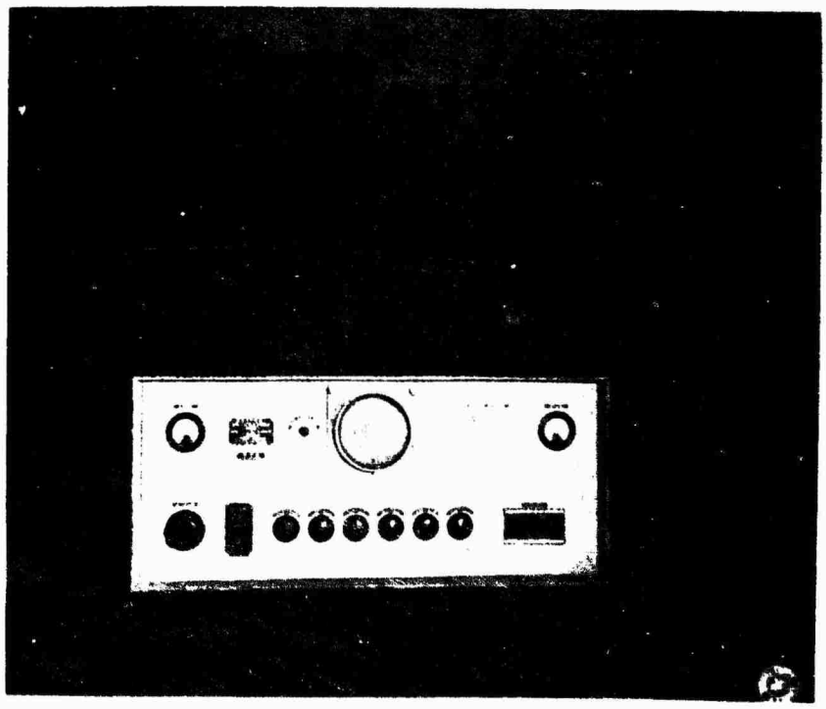
Radio detector, fixed type (GCA11-6)

Reciever arrangement

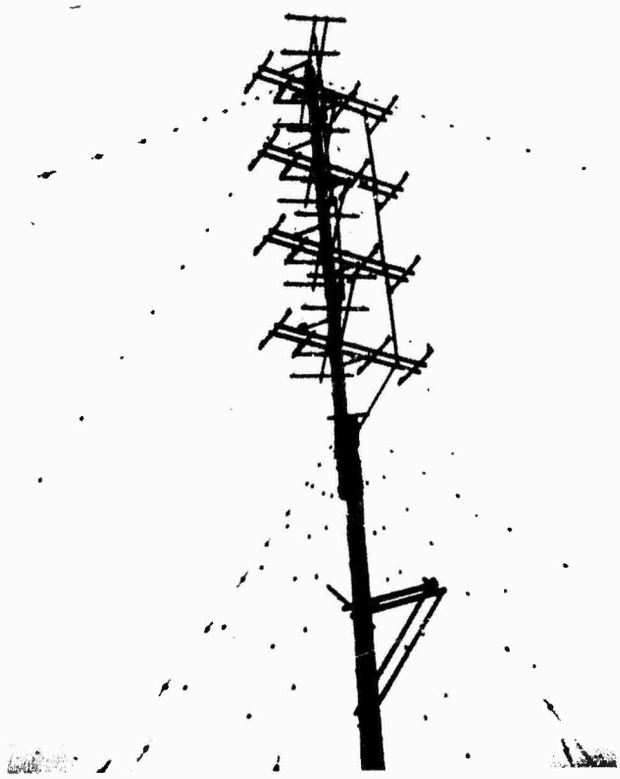




Receiver Unit for Tachi-6.

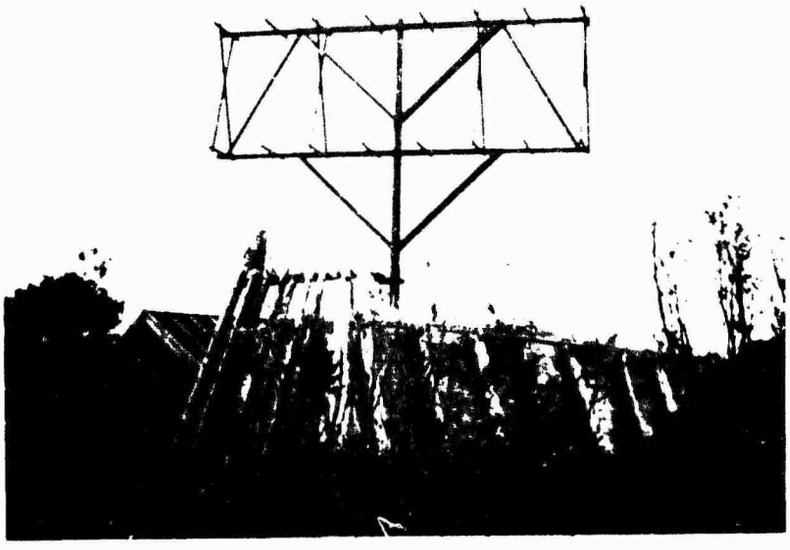


Indicator Unit for Tachi-6.



Above: Tachi-6
Transmitting
Antenna

Below: Tachi-6
Receiving
Antenna



TACHI - 7

RADIO DETECTOR FIELD USE TYPE

Corresponding Allied Designation: Chi-B (M).

Technical Characteristics:

f = 100 MC/S. 50 KW. Range 200 Km.
Accuracy: Range, ± 5 Km; Azimuth, ± 5°.

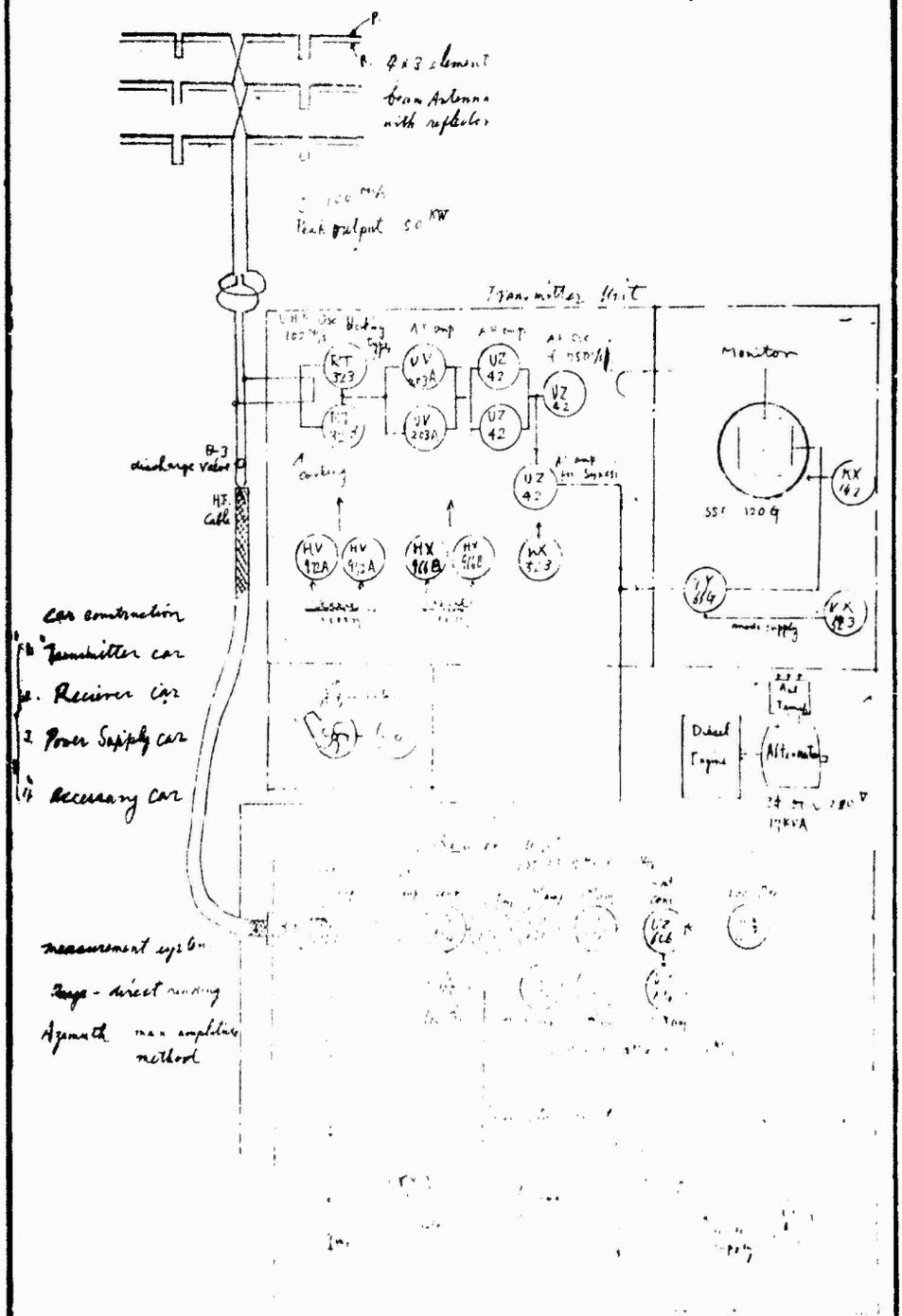
Number Built = 60. Number Installed = NUMEROUS

Description:

Taohi-7 was the chief mobile early warning radar. Three trucks or trailer mounts served to facilitate its moving into locations where the larger fixed Taohi-6 installations were not practicable. Taohi-7 was naturally sent further from the homeland and was found on Chichi Jima, Miyako Jima, and Okinawa. One was captured by Allied forces in the Philippines. It was also a popular standby set for Tachi-6 installations, and was thought with its different frequency to give some insurance against jamming.

A single antenna array is used for transmitting and receiving; a gas filled T-R tube tends to protect the receiver against the transmitted pulse. A type A display is used on a 120 cm tube. The claimed azimuth accuracy of ± 5° is highly problematical.

Radio Detector Field Use Type (Taski 7)



TACHI - 18

RADIO DETECTOR-CARRIER TYPE

Corresponding Allied Designation: ----

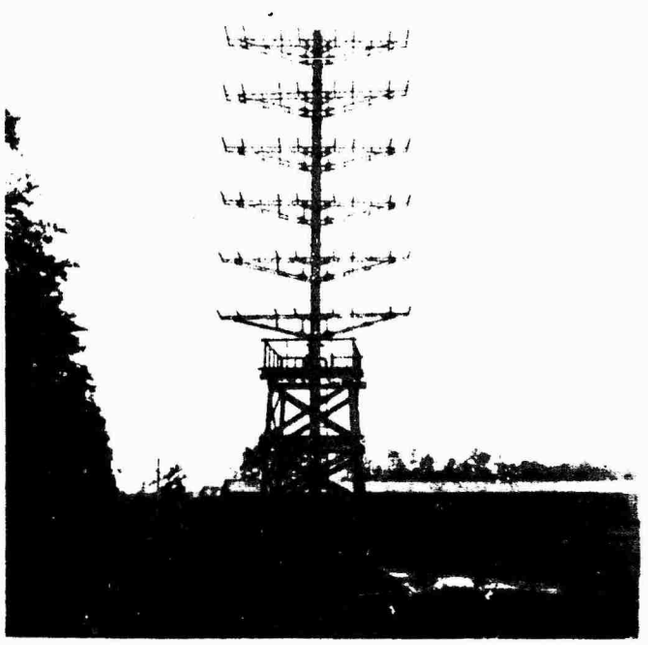
Technical Characteristics:

f = 94, 98, 102, 106 MC/S. 50 KW. Range 300 Km.
Accuracy: Range, ± 5 Km; Azimuth, ± 5°.

Number Built = 400. Number Installed = FEW

Description:

This is the third and lightest (4 tons) of the stock Japanese early warning sets, and in spite of the formidable proportions of the 6 x 4 element antenna was designed to be transportable in trucks. The units are not unlike those of the Tachi-7 although a different modulator plan is used. The antenna is motor driven at 2 rpm, and gives a remote azimuth indication by means of selsyns. An A-type display with a 0-300 km scale is used.

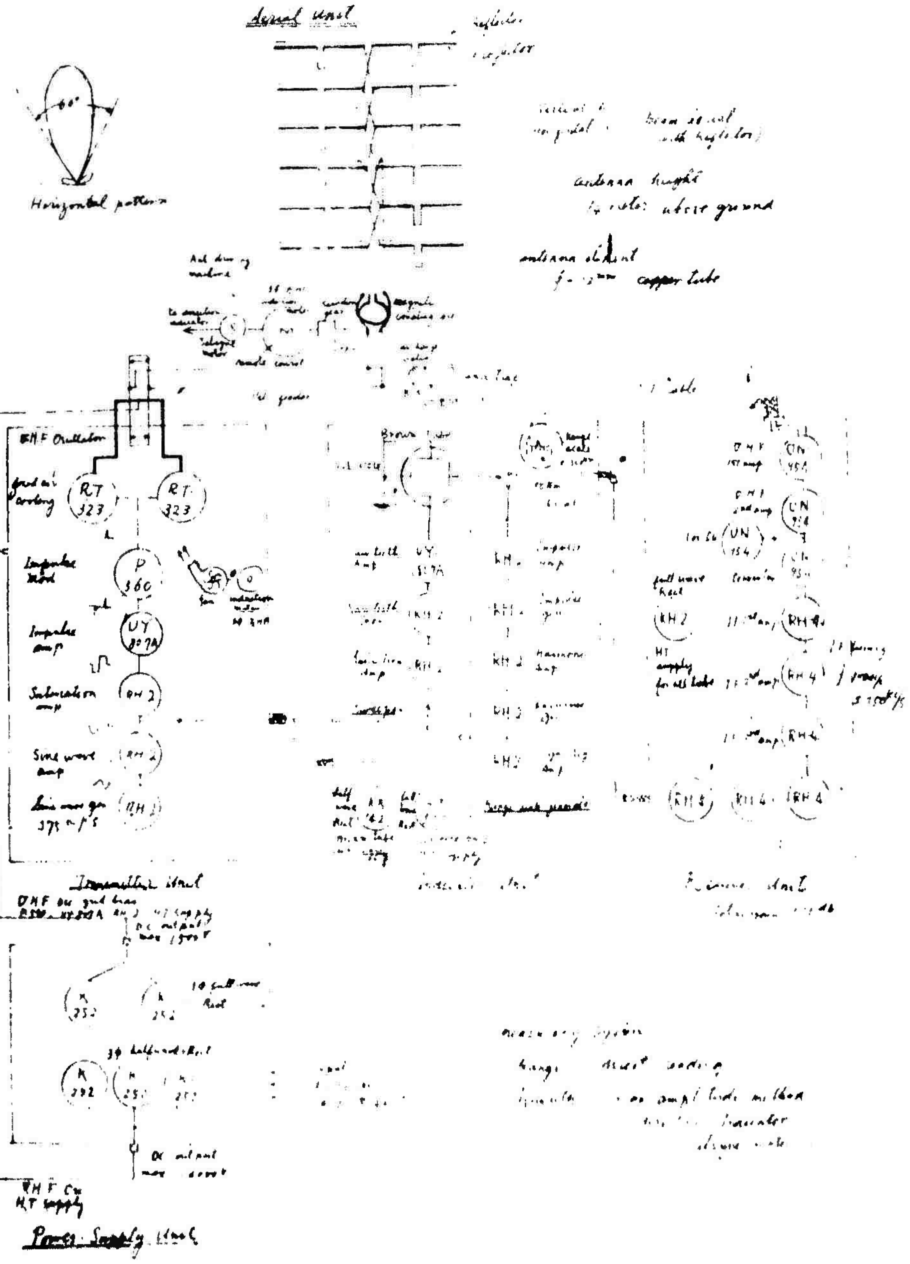


Antenna for Tachi-18 - Kodaira School.

Antenna for Tachi-18 - Kodaira School.

Radio Detector carrier type (Tachi-18)

manufactured by Iwasaki & Tokyo Shibaura Communication Co Ltd



TACHI - 35

RADIO DETECTOR FOR ELEVATION MEASURING

Corresponding Allied Designation: ----

Technical Characteristics:

f = 82 MC/S. 50 KW. Range 100 Km.
Accuracy: Range, ± 1 km; Azimuth, ± 1°; Elevation, ± 600 M.

Number Built = 3. Number Installed = 3.

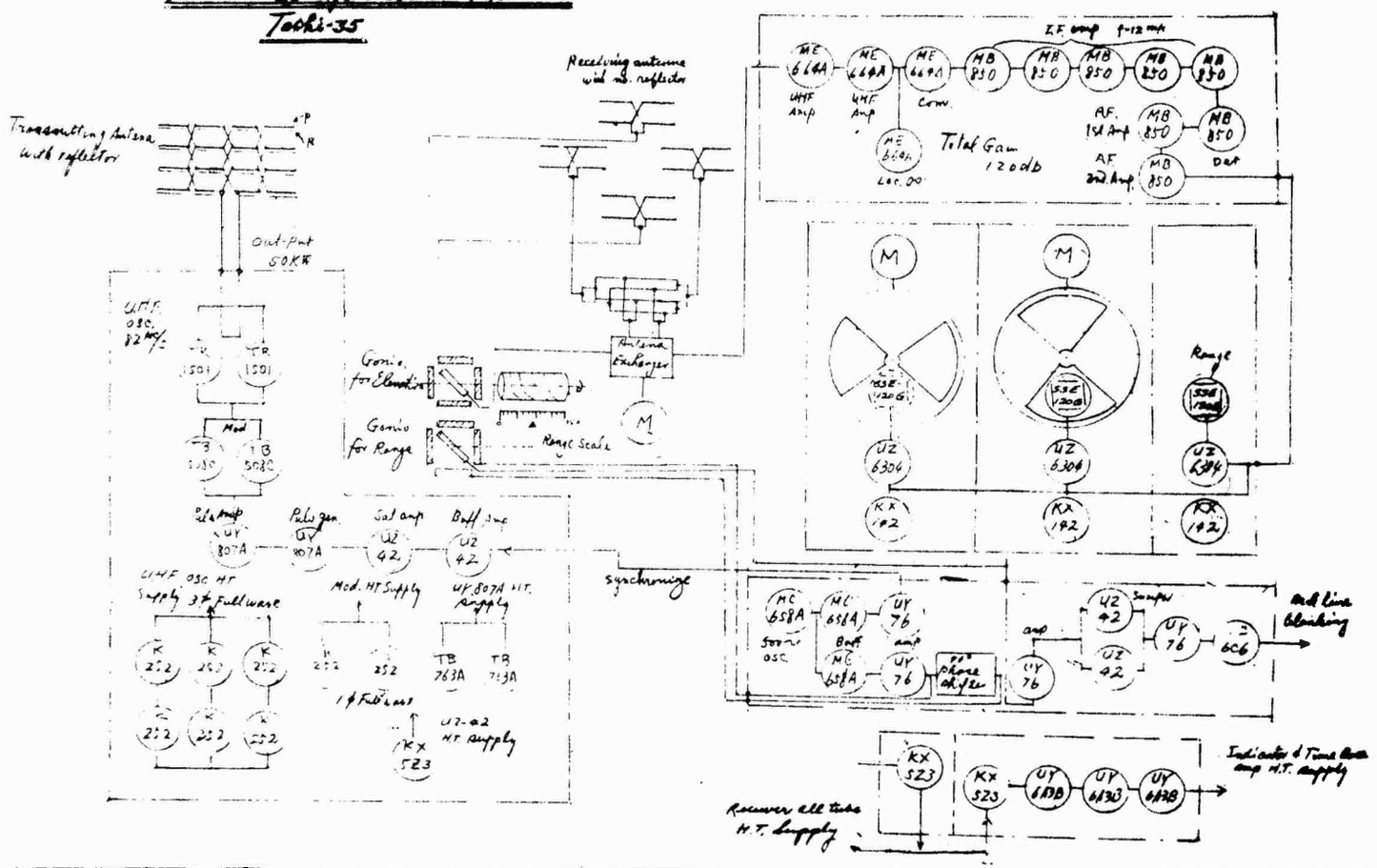
Description:

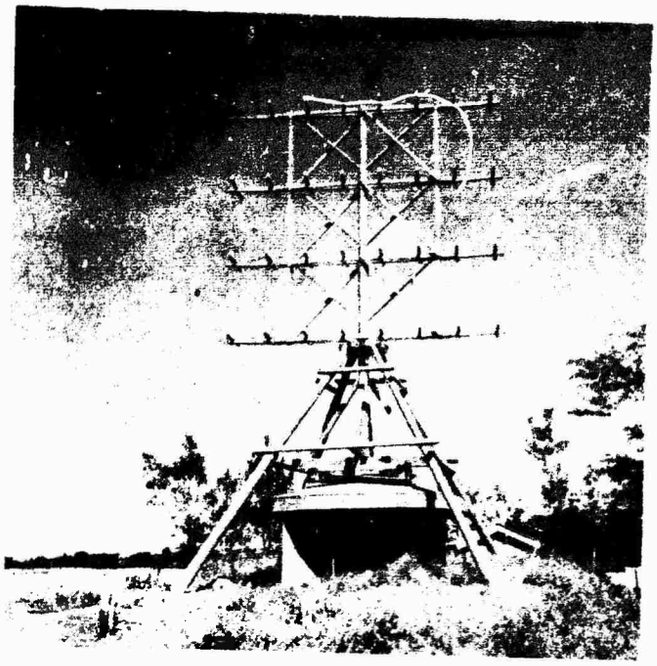
Tachi-35 was installed at 3 strategic locations in the Tokyo area for giving height data on approaching aircraft. An antenna switch arrangement on the receiving antenna permits alternate comparisons of the signal magnitudes from a pair of left and right lobes and a pair of vertical lobes. A goniometer pick up is varied in each case until the pips are the same height. Entering a calibration chart with goniometer range and elevation readings then gives the airplanes height.

Color disks are placed before the elevation and azimuth pip matching scopes (as on Tachi-3 and Tachi-20) containing 90° sectors of red and green filters. They are synchronized with the antenna switch so that when the left (or upper) lobe is operative a red pip is seen, and when the right (or lower) lobe is operative a green pip is seen. Instead of the pips being displaced along the scope base line as in customary American practise, they appear at the same point. Then when the superimposed red and green pips coincide exactly in height the result to the eye should be white. This idea is probably taken from British GL Mark II set captured early in the war.

Radio Detector for Elevation Measure

Tachi-35





Transmitting Antenna for Tachi-35.

TACHI - 20

RADIO DETECTOR FOR ELEVATION ANGLE MEASURING

Corresponding Allied Designation: ----

Technical Characteristics:

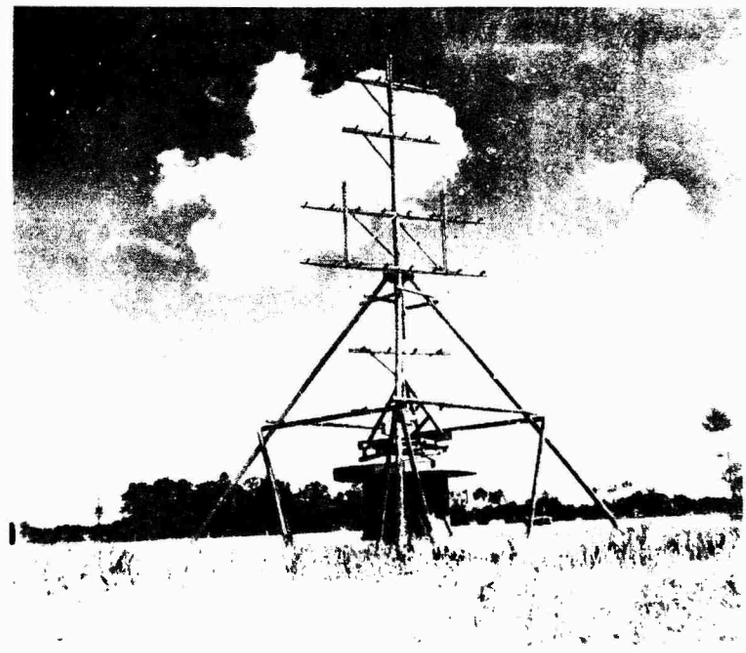
f = 68, 72, 80 MC/S. Range 100 Km.
Accuracy: Range, ± 1 Km; Azimuth, ± 5°; Elevation, ± 500 M.

Number Built = 12. Number Installed = FEW

Description:

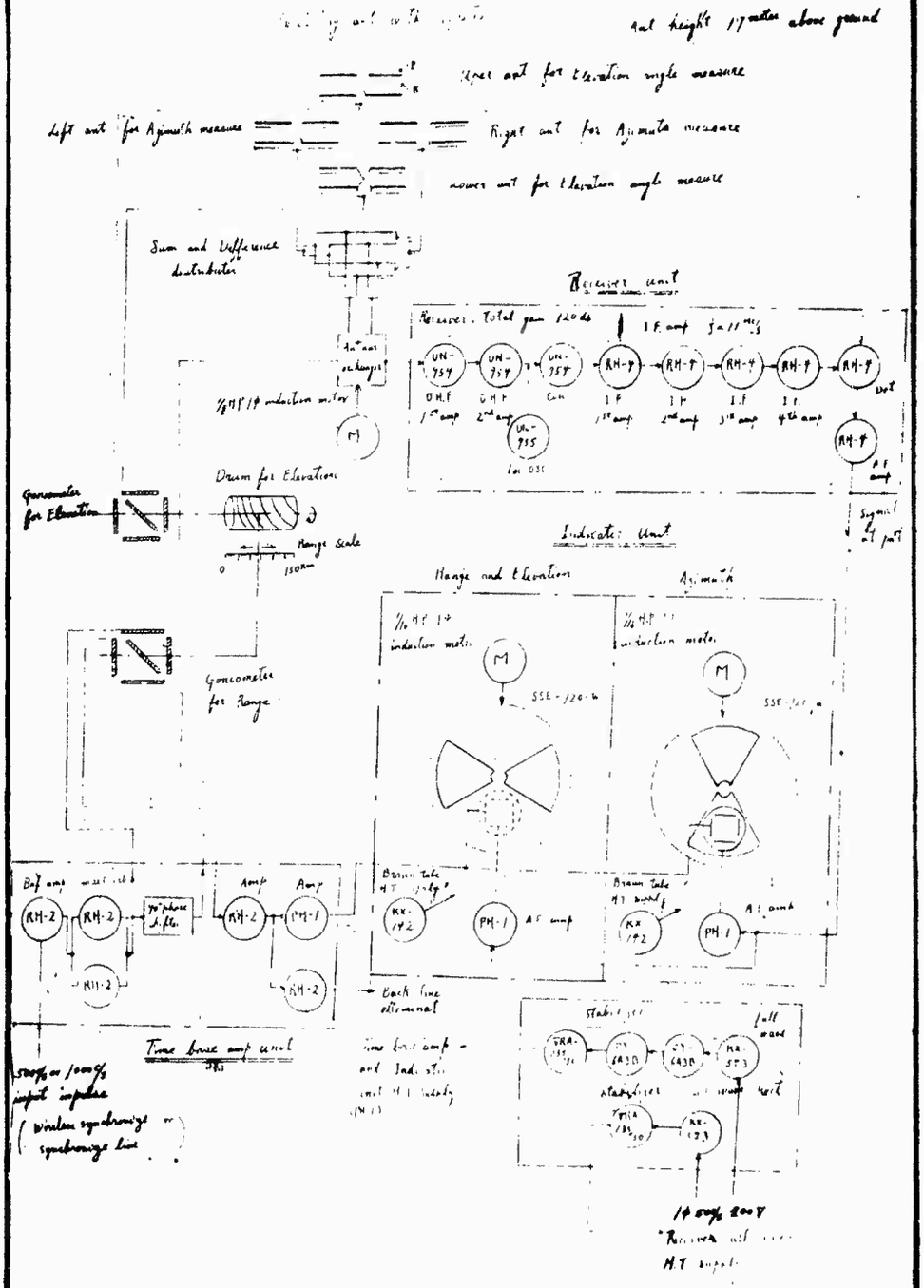
Tachi-20 is a receiving unit added to important Tachi-6 stations to give height estimates, supplementing the normal 3 to 5 search receivers.

Azimuth is measured by comparing return echo heights from left and right antennas on a color disk scope (as in Tachi-35). Range and elevation are estimated by the combined positions of two goniometers registering range and elevation angles obtained from the diffraction patterns of pulses received by the upper and lower antennas. Color disk pip matching is used again here to locate the matched point.



Antenna for Tachi-20.

Radar Detector for Elevation angle measure (Type-20)



TASE - 1

RADIO DETECTOR MARINE USE

Corresponding Allied Designation: None.

Technical Characteristics:

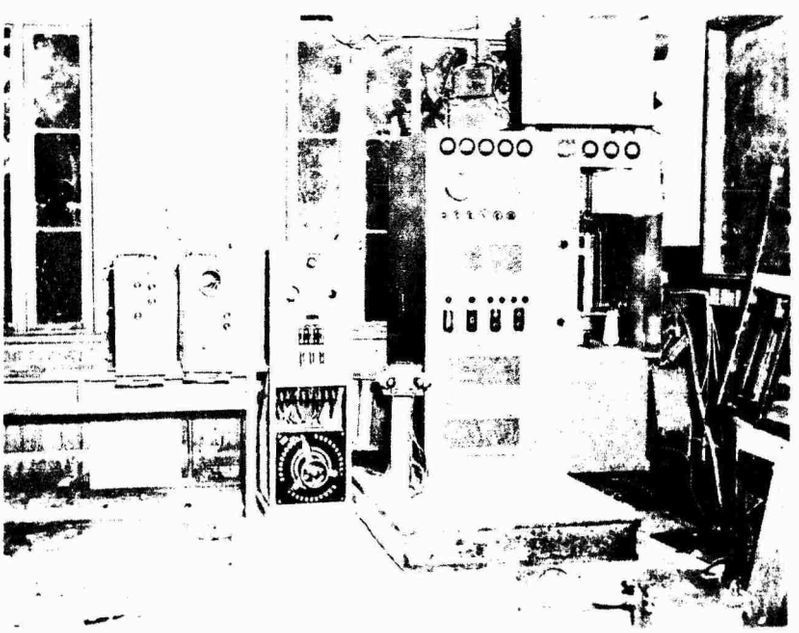
f = 110 MC/S. 50 KW. Range 300 Km.
Accuracy: Range, ± 5 Km; Azimuth, ± 7°.

Number Built = 30. **Number Installed** = Few.

Description:

This set was designed to be used on army transports for long range detection of the approach of enemy aircraft. Results were unsatisfactory, however, so plans were made to transfer it to land use.

Separate antennas are used for transmitting and receiving; control of azimuth is by the Ward Leonard System.



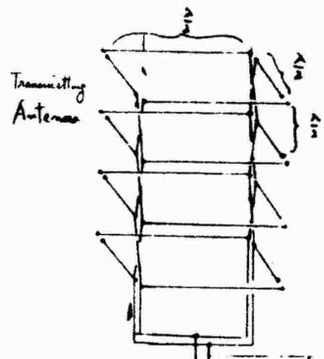
Tase-1 Transmitter, Receiver, Indicator, and Control Equipment - Kodaira School.

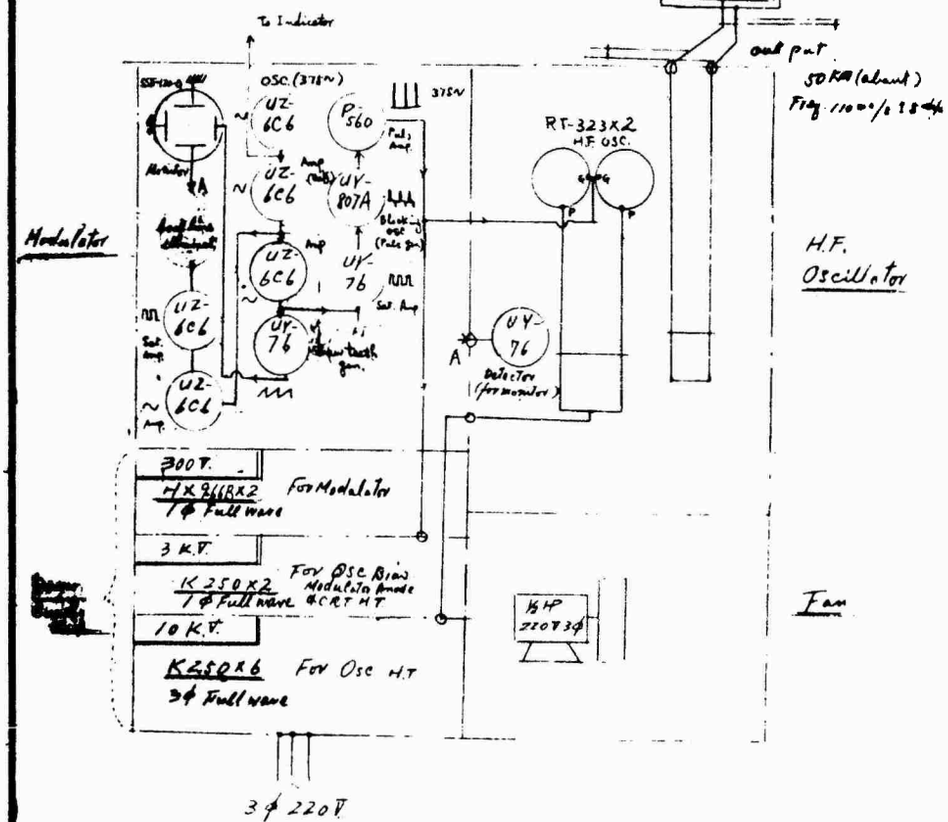
Radio Detector (Marine use) (Type-1)

Transmitter

Manufactured by Tokyo Elect. Co.

Freq – 110 Mc/s ± 2 %
Out put – 50 Kw peak.
Modulation freq. 375 ~

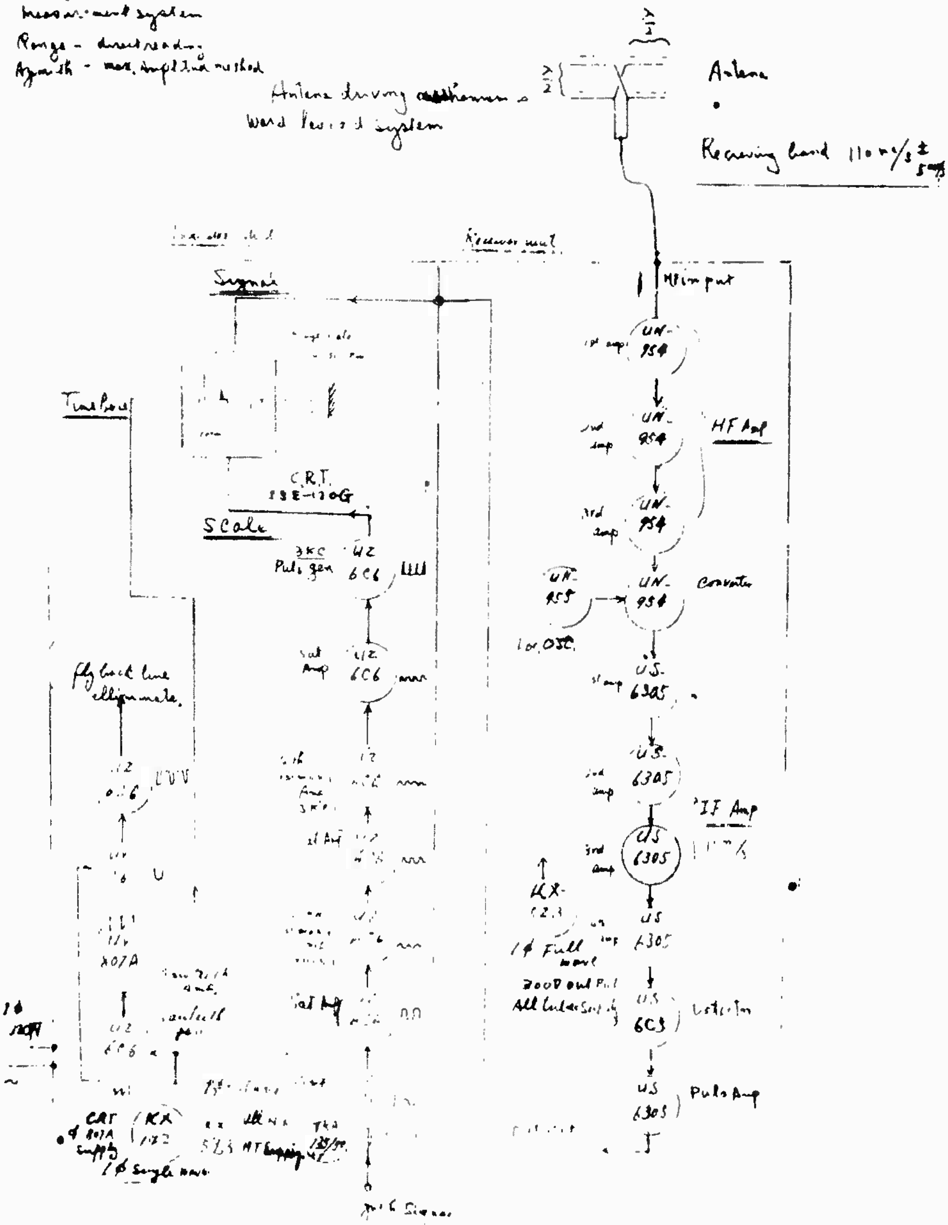




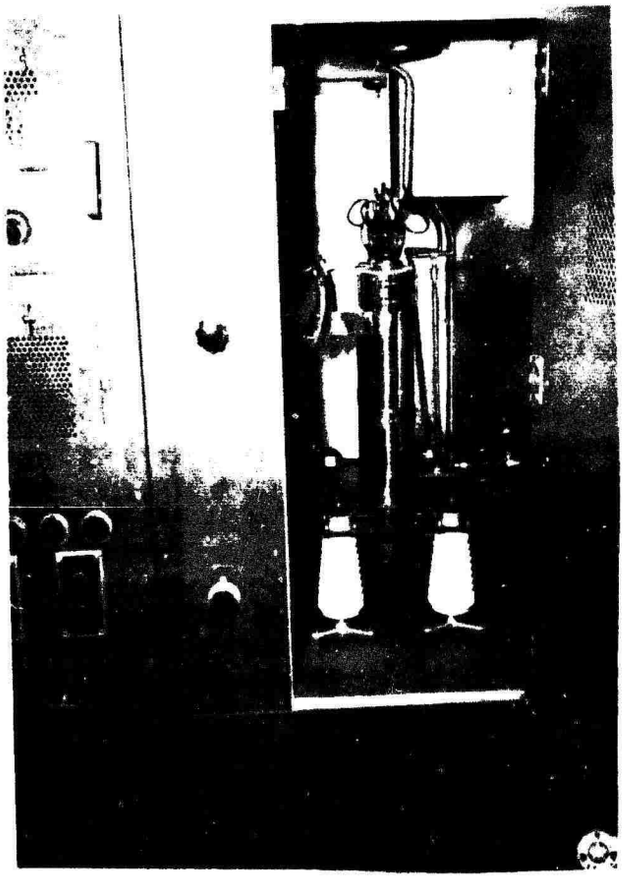
Radio Detector (Marine Use) (Tase-1)

Receiver & Indicator ... manufactured by Tokyo Elect. Co

Freq — 110 m/s ± 5%
measurement system
Range - direct reading
Azimuth - max. amplitude method



Tase-1 Receiving Antenna for Shipboard Mounting.



Transmitter Tubes and High Frequency Tuning Section of Tase-1.

TASE - 10

RADIO DETECTOR FOR SUBMARINE USE

Corresponding Allied Designation: ----

Technical Characteristics:

f = 150 MC/S. 10 KW. Range 50 Km.
Accuracy: Range, ± 3 km non-directive.

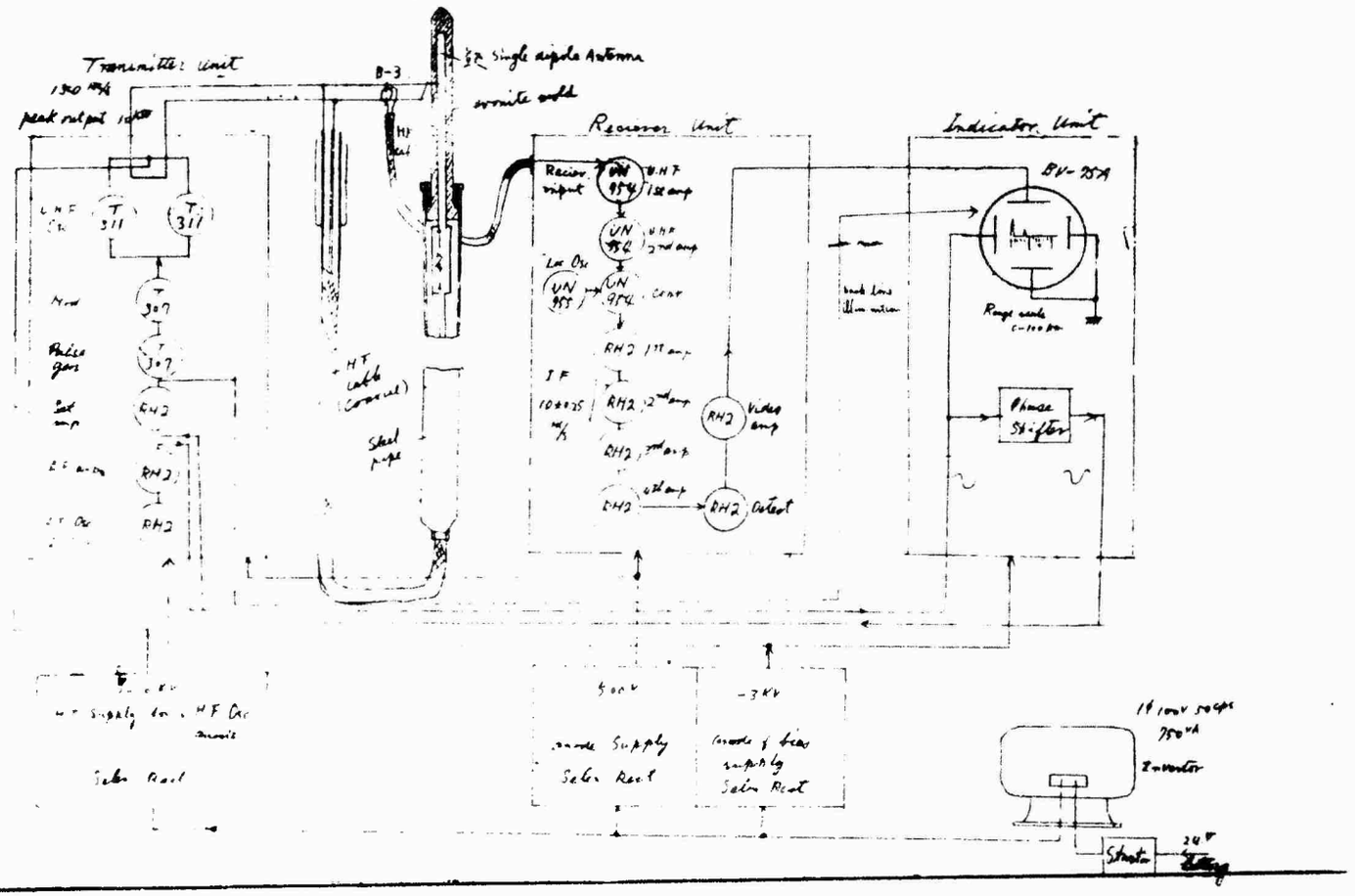
Number Built = 10. Number Installed = 1.

Description:

This set which was to provide all round warning of approaching aircraft was installed on the Japanese Army's only transport submarine of suitable size. Conflicting reports of the set's fate are given. One says that the warehouse containing the set destined for installation was bombed and destroyed. Another says the set was actually installed but due to inadequate electrical power on the submarine tests were never completed. A third says the submarine was sunk. The remaining sets were modified for land use with a 3 x 2 mattress antenna.

A single half wave vertical stub antenna is used projecting above the submarine's hull. An A-type displays shows the range of any targets but not their azimuth.

Radio Detector for Submarine Use (Type 10)



TASE - 2

RADIO DETECTOR FOR SEA SEARCH

Corresponding Allied Designation: ----

Technical Characteristics:

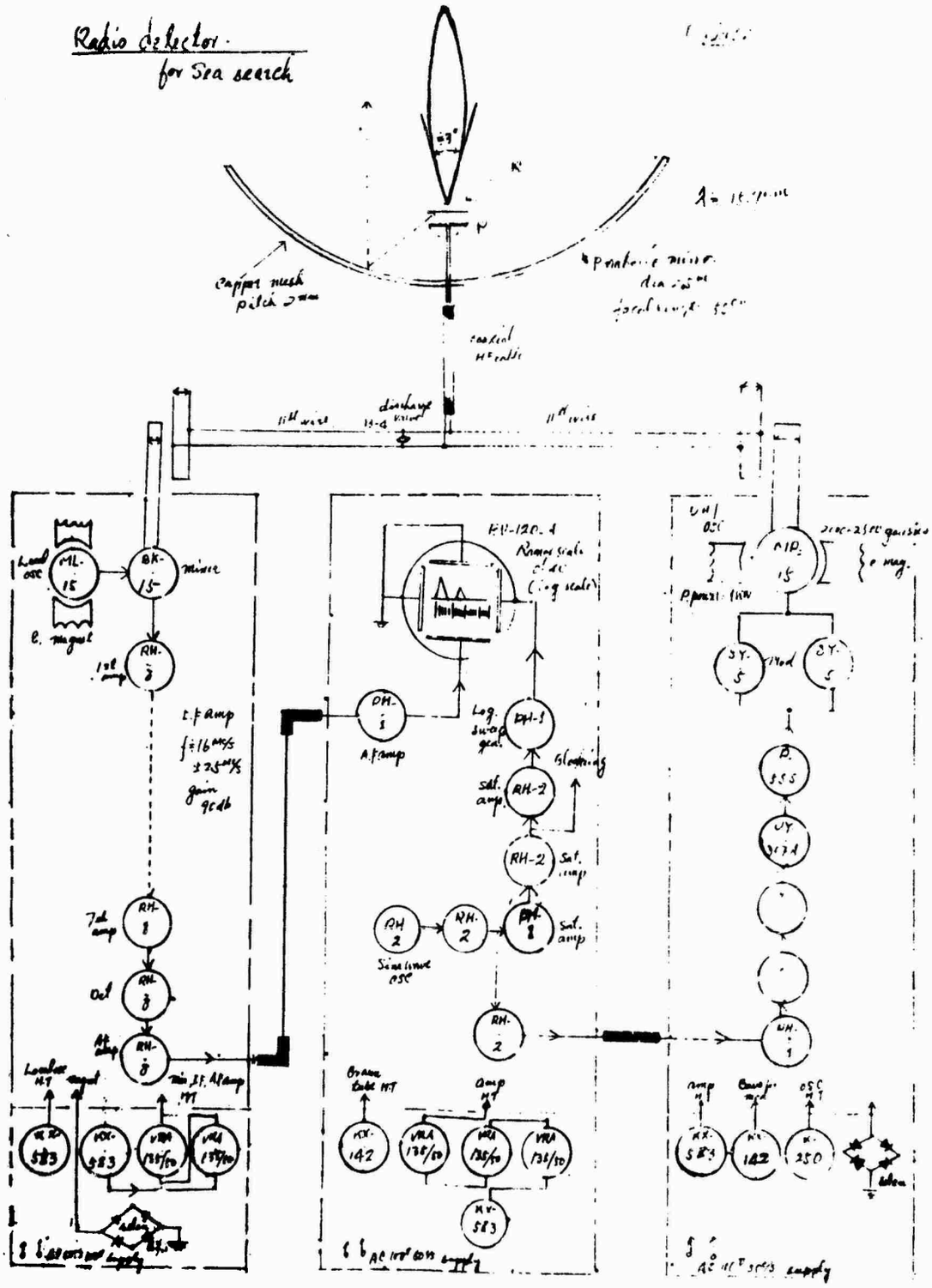
Wavelength = 15.7 cm. 1 KW. Range against: ships, 30 Km; subs, 15 Km.
Accuracy: Range, ± 100 M; Azimuth, ± 1°.

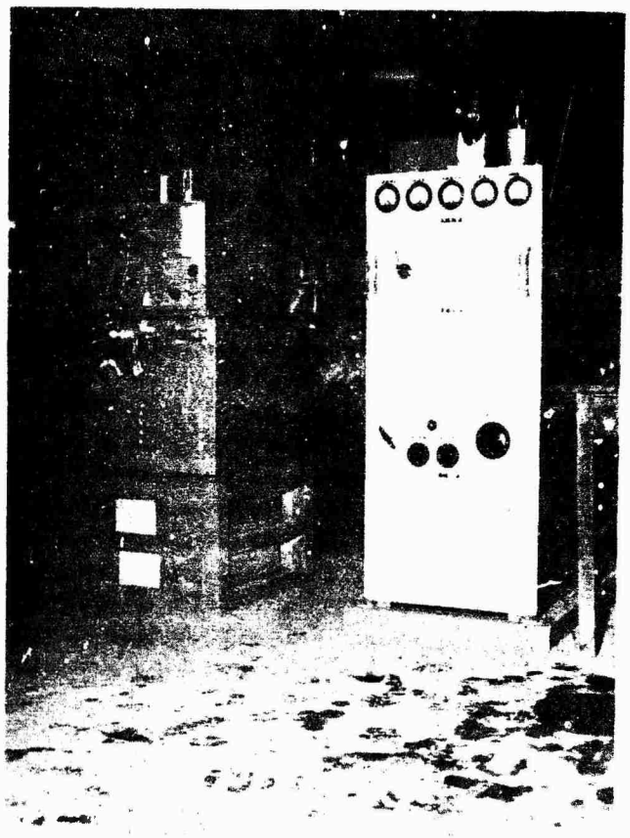
Number Built = 80. Number Installed = FEW, UNSATISFACTORY.

Description:

This set for army transport surface protection was designed to operate at a wavelength of 20 cm. However, at this time a 15 cm air cooled magnetron was being developed by Nihon Musen (the MP-15) and after the building of 20 sets by Tokyo Shibaura the set was changed to operate at this wavelength. A very small magnetron (also with electromagnet) was used as local oscillator with a specially designed "Barkhausen-Kurz" mixer tube (BK-15). The large paraboloid antenna with dipole horizontally polarized and rod reflector in front of it was hand swung in azimuth. The set used a hydrogen filled TR tube containing a fixed tungsten gap whose life was only about 30 operating hours.

Tase 2 proved quite unsatisfactory because the transmitting magnetron developed so little power (1 kw) that submarines could not be detected beyond 2-3 km. Nihon Musen urged the army to adopt the already successful navy 10 cm set No. 22 instead of building Tase 2, but the army could not be convinced until too late. Eventually the army switched to the No. 22 set.


Radio detector
for Sea search
Copper mesh
pitch 2mm
coaxial
H.F. cable
discharge
11 kV wire
11 kV wire
Local osc
ML-15
BK-15
mixer
I.F. amp
f=16 mc/s
±2.5 mc/s
gain 90 db
7th amp
6th
5th
4th amp
Local H.T.
signal
1st I.F. Amp
H.T.
RH-120-1
Range scale
d.c.
Ring scale
RH-1
A.F. amp
Log. sweep gen.
Blanking
sat. amp.
RH-2
Sat. amp
Sine wave osc
Beam tube H.T.
Amp H.T.
VHF/OSC
MP-15
2 mag.
Phase shift
SY-5
Mod
B.555
UY 927A
RH-1
Amp H.T.
Beam foc. mag.
OSC H.T.
Receiver unit
Indicator unit
Transmitter unit



Tase-2 Transmitter, Receiver and Indicator, Showing Transmitting and Receiving Magnetrons.

TAKI - 1 TYPE II

AIRPLANE RADIO DETECTOR FOR SEA SEARCH

Corresponding Allied Designation: Taki Mark 1.

Technical Characteristics:

f = 150 MC/S. 10 KW. Range against: ships, 100 Km; subs, 20 Km.
Accuracy: Range, ± 2 Km; Azimuth, ± 5°.

Number Built = 1000. Number Installed = NUMEROUS

Description:

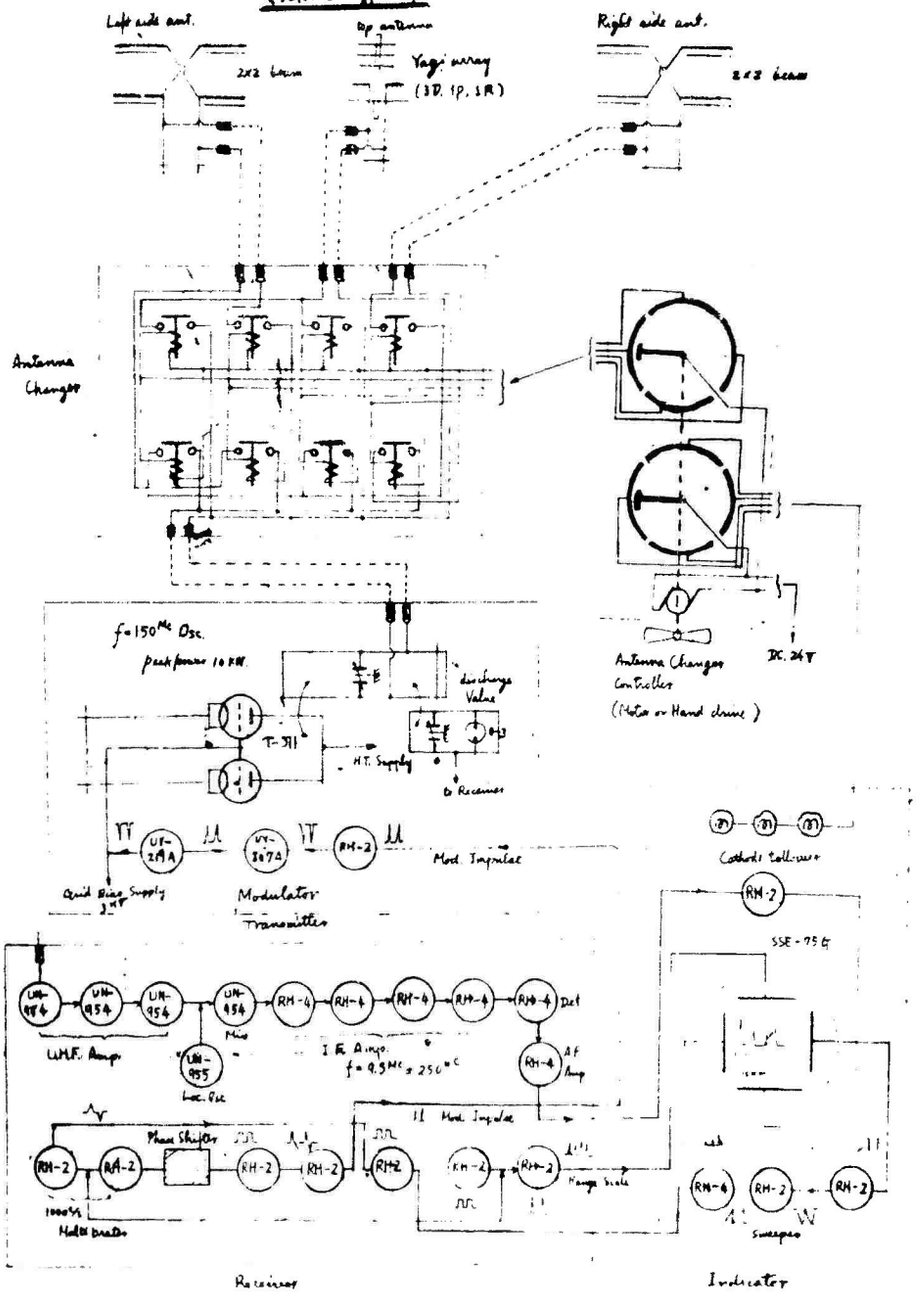
This first airborne radar set was completed in 1943 for use on heavy bombers. (Later a lighter version called Taki 1, Type II was developed with similar characteristics for smaller planes.) Notable is the fact that only 6 months elapsed between the setting of the specifications and sets coming off the assembly line at Nihon Musen.

Three antennas are used, a forward looking Yagi, and a 2 x 2 array on either side of the fuselage for sidewise searching. By means of an "antenna changer" any one can be rested upon at will. Or by means of a motor drive all three can be run through in rapid sequence. An indicator light shows at any instant the particular antenna connected. Transmitting and receiving are done on the same antenna, a TR tube (B-3) being used to protect the receiver. A simple A-type presentation giving range is used. A series of pips spaced 10 km apart with a phase shifter to zero them on the main pulse gives an accurate range on targets.

The equipment, though heavy, was reported to have given very satisfactory surface search results.

Aeroplane Radio Detector for Sea-Search

(Taki-1 "Type II")



TAKI - 1 TYPE IV

AIRPLANE RADIO DETECTOR FOR SEA SEARCH

Corresponding Allied Designation: ----

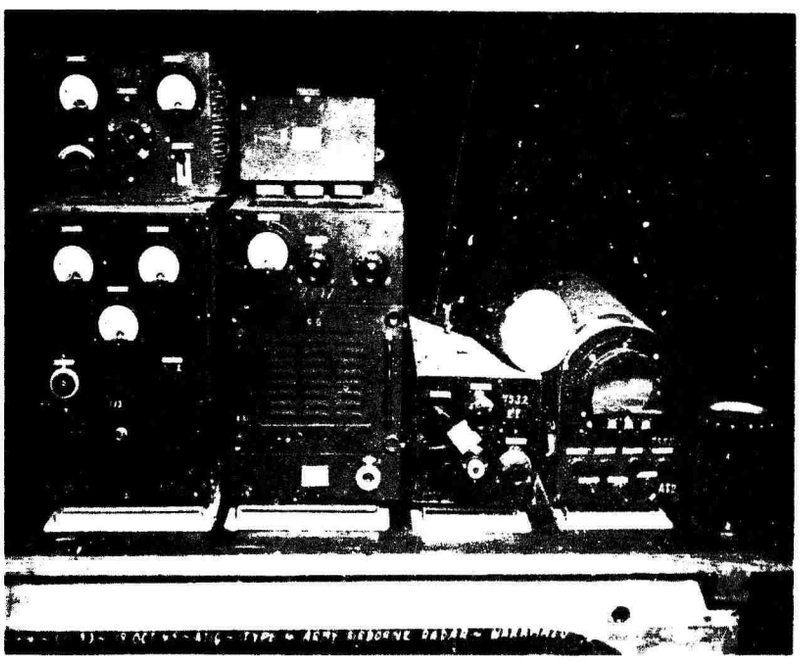
Technical Characteristics:

f = 150 MC/S. [illegible] KW. Range against: ships, 100 Km; subs, 20 Km.
Accuracy: Range, ± 2 Km; Azimuth, ± 5°.

Number Built = None; test model under construction.

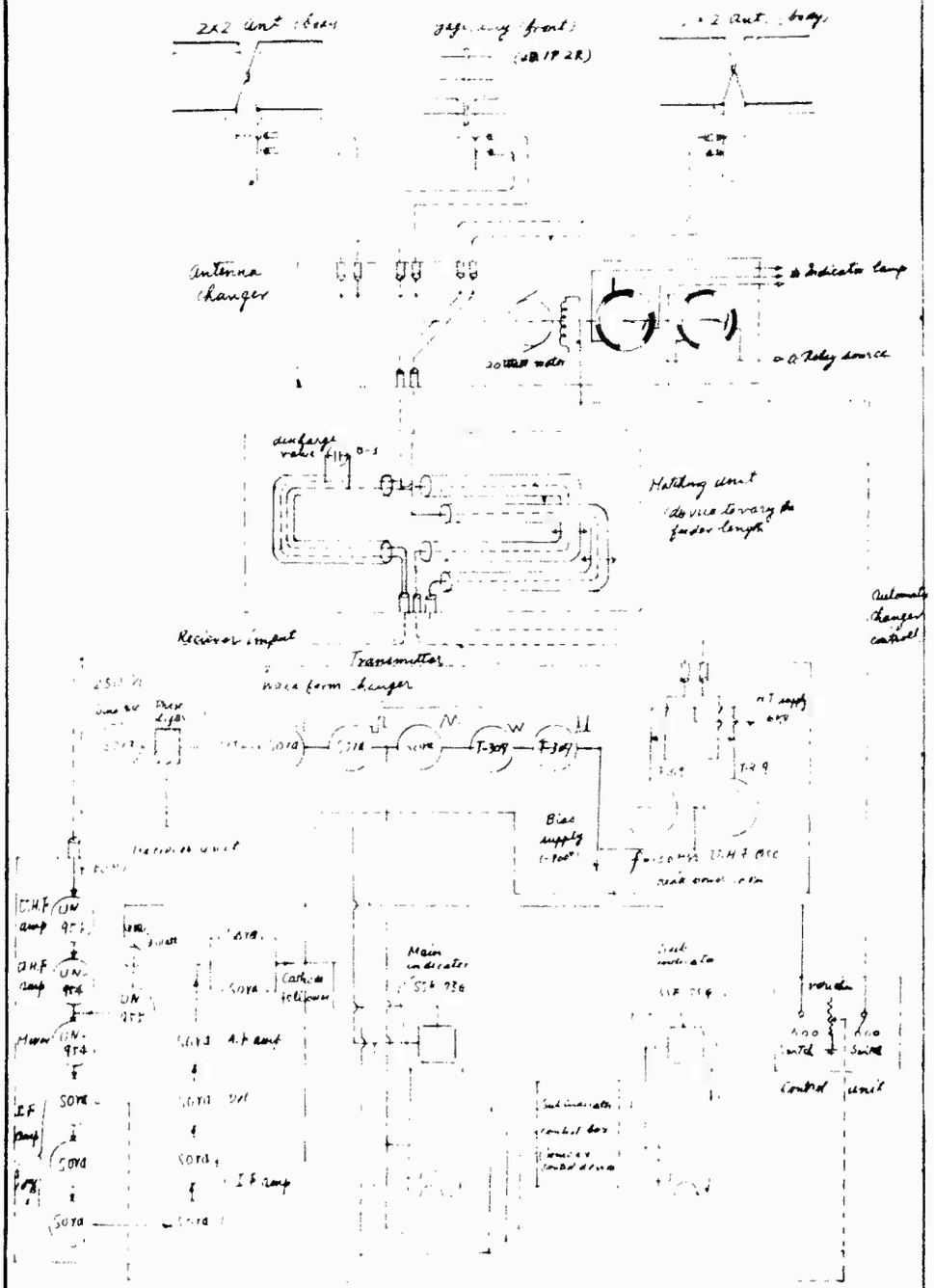
Description:

Taki 1 Type IV was designed as a lighter set to replace Taki 1 Type II (80 kg vs 150 kg). Similar operating characteristics and performance were expected. Two A-type scopes connected in parallel were provided.



Taki-1, Type 4 Airborne Search Radar.

Aeroplane radio detector for sea-search
(Taki-1, type-II)



Taki-1, Type 4 Radar, Showing Interior of Components.

TAKI - 3

AIRBORNE SEA SEARCH RADAR

Corresponding Allied Designation: ----

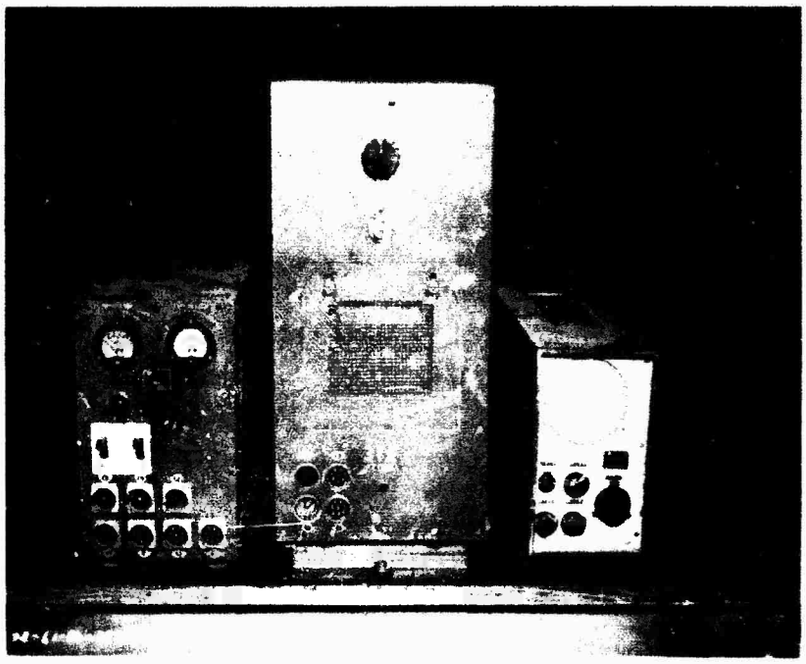
Technical Characteristics:

f = 375 MC/S

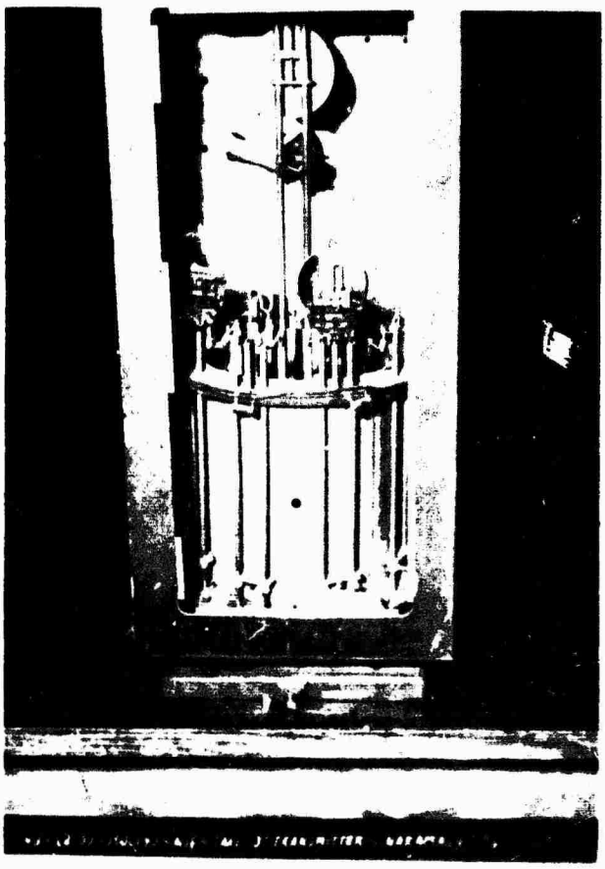
Number Built = 50 Number Installed = 0

Description:

This airborne surface search set was an experimental model using an 8 tube ring oscillator for the transmitter. A pin fastened to the lecher wire shorting bar runs in a spiral groove cut in a disk as shown in the photo; it provides an ingenious method for precision knob tuning of the transmitter from the front of the panel. The set was developed in August 1943 by the radio department of the Aeronautical Laboratory, Tokyo Imperial University. Two Yagi antennas were to be placed side by side projecting from the nose of the plane. Tama Institute rejected the set in 1944 because of its poor performance; unfortunately 50 sets had already been built.



Taki-3 Airborne Search Radar.



Transmitter of Taki-3 Showing 8-tube Ring Oscillator in the Transmitter Unit, and Spiral Control of Lecher Rod Tuning.

TAKI - 24

AIRBORNE 10 CM SEARCH RADAR

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 10 cm. Power: unknown. Range: unknown.

Number Built: One under experimental construction.

Description:

Taki-24 employed almost the same circuits as Taki-14 described previously, with the exception that a 10 cm magnetron was used and the dimensions of the high frequency coaxial tuning and transmission circuits were correspondingly reduced. (In the 5 cm version, Tachi-34, the transmission lines were replaced by rectangular wave guides.) Two glow discharge "valves" are used to protect the receiver while transmitting.

Primary research was concentrated on Taki-14, with Taki-24 and -34 to be next in line up on its satisfactory completion.

(For block diagram see Taki-14)

TAKI - 34

MICROWAVE AIRBORNE SEARCH RADAR

Corresponding Allied Designation: ----

Technical Characteristics:

f = 6000 MC/S (λ = 5 cm). 1 KW. Range 15 Km.
Accuracy Unknown.

Number Built = 1 experimental model.

Description:

This set was the Japanese army's bid to equal the performance of the APQ-13 found in American B-29s. Many of the ideas incorporated were directly inspired from studies their engineers made on captured sets.

A 5 cm magnetron was developed by the Sumitomo Company, but its output was only about 1 kw. An 80 cm paraboloid antenna reflector was fed by a waveguide, after passing through two rotary joints. The antenna rotated at 20-60 rpm and tilted from 0° to -60°.

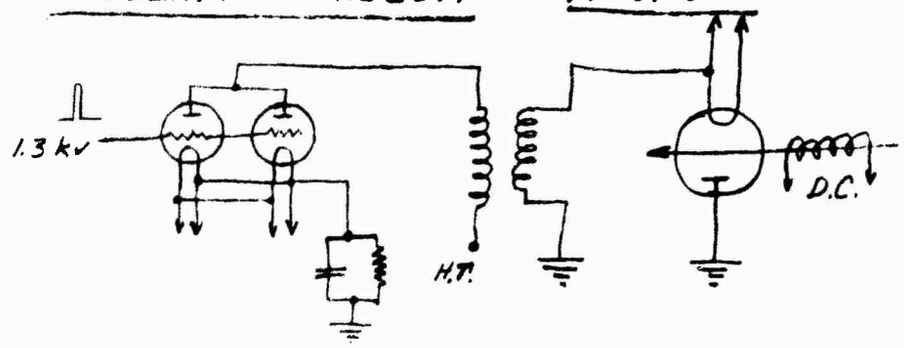
A double superheterodyne receiver was used with crystal mixer and a velocity modulated beat frequency oscillator. I.F. frequencies were 100 MC and 27 MC.

Display was on a 0 to 50 km range PPI scope with variable range circle, and on a parallelled A-type scope with corresponding bright dot range mark.

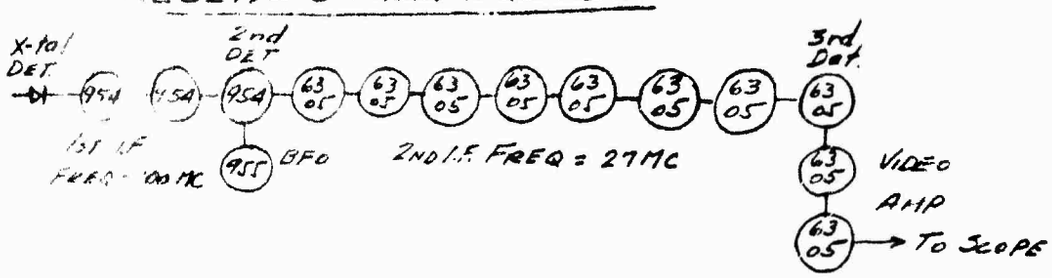
Altitude determination was by a calibrated sweep delay circuit which narrowed the ground return circle until it became just a dot. Altitude ranges were 0 to 15 km.

Research was begun in November 1944, and the one experimental set resulting was turned over to the Army for testing in July 1945. Ranges obtained from a high point land installation were very disappointing, being only 12 to 16 km.

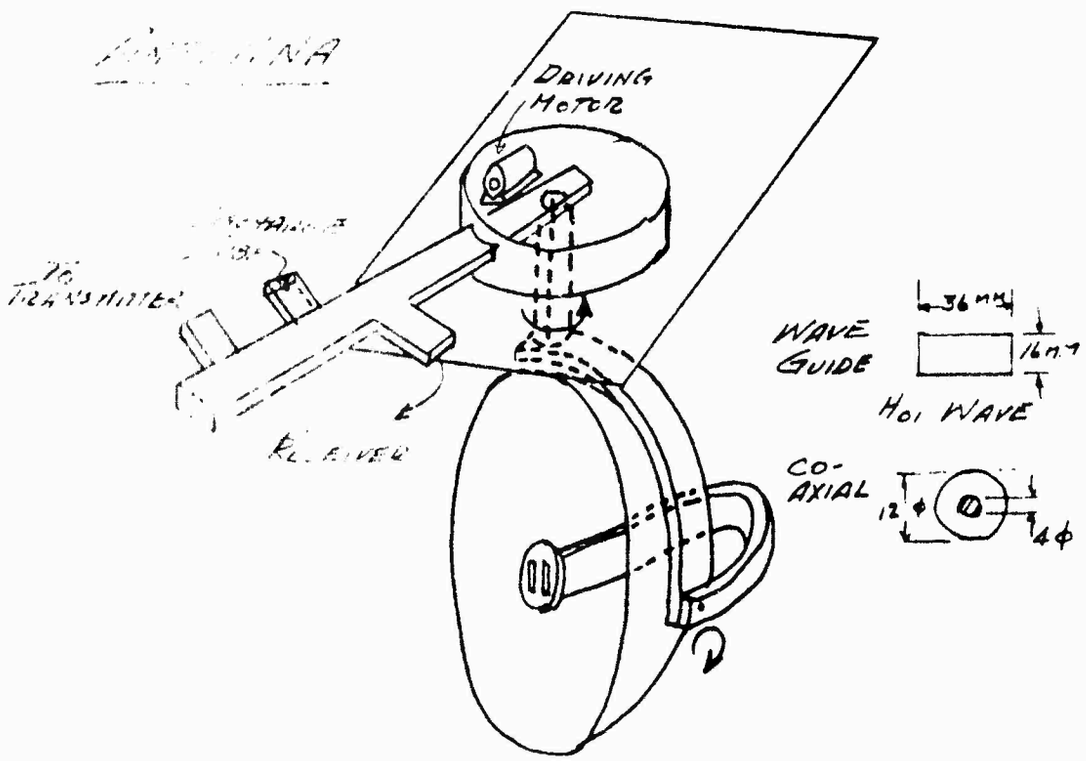
OSCILLATOR CIRCUIT - TAKI 34



RECEIVER ARRANGEMENT



ANTENNA



TACHI - 1

RADIO LOCATOR TYPE 1

Corresponding Allied Designation: Mark Ta Model 1.

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 20 Km.
Accuracy: Range ± 100 M; Azimuth ± 1°; Elevation ± 2-3°.

Number Built = 30. Number Installed = several.

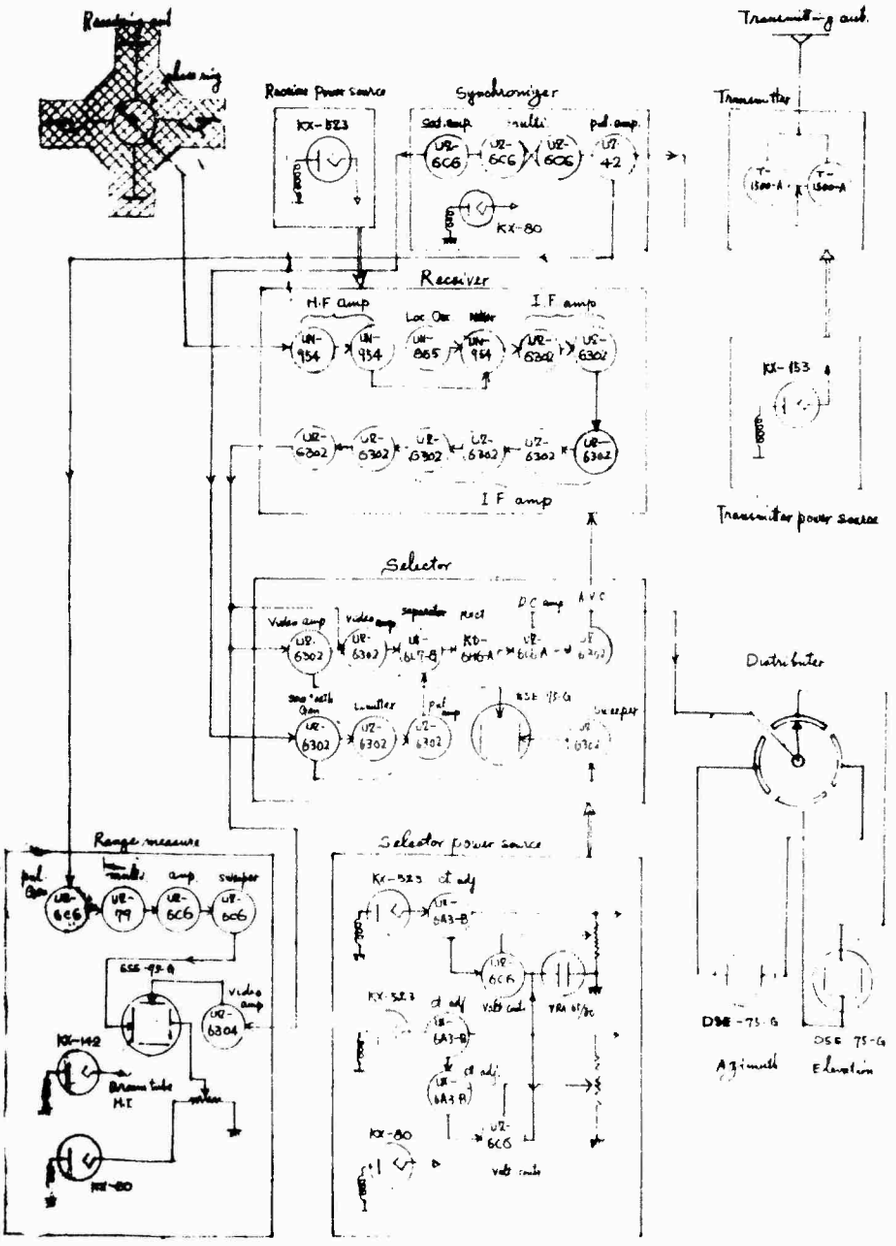
Description:

This set of the "locator" type is to provide data at important bases for antiaircraft gun firing. A simple transmitting antenna and four receiving antennas with screen reflector are used, the latter being principally relied upon to give azimuth and elevation. A 4 segment distributor synchronized with the progressive phasing of the 4 receiving antennas, switches the received signal echoes to the corresponding deflecting plates in the azimuth and elevation cathode ray tubes. Pip heights on either side of the scope base lines are matched by eye.

In practise the power output was only half (5 kw) of the designed value, and relatively poor range results were obtained. Expected ranges of 20 km on single aircraft turned out to be only half that great.

Radio Locator "type-1" (Taichi-1)

manufactured by Sumitomo



TACHI - 2

RADIO LOCATOR TYPE 2

Corresponding Allied Designation: Mark Ta 2.

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 20 Km.
Accuracy: Range, ± 100 M; Azimuth, ± 1°; Elevation, ± 1°.

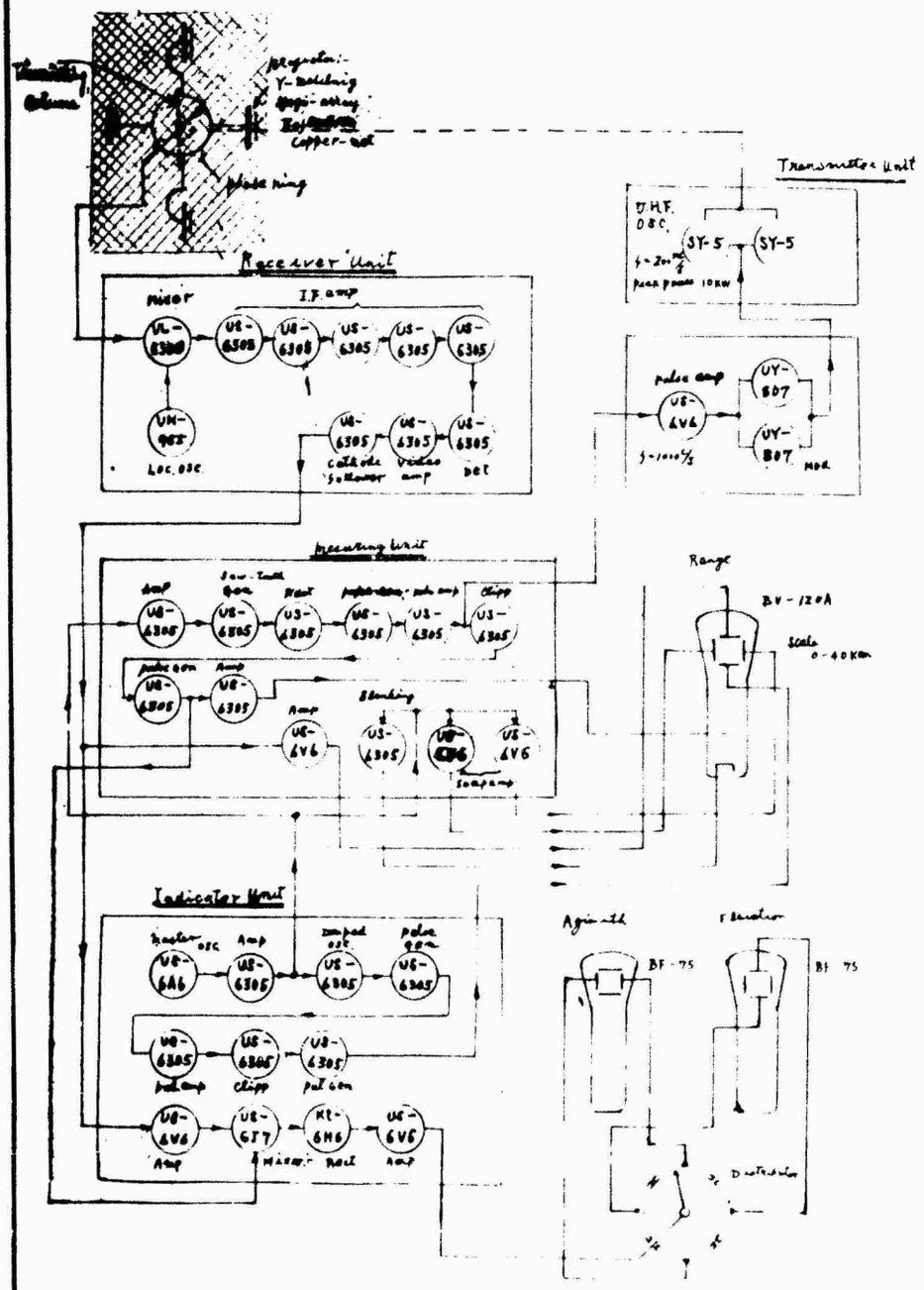
Number Built = 35. Number Installed = SEVERAL

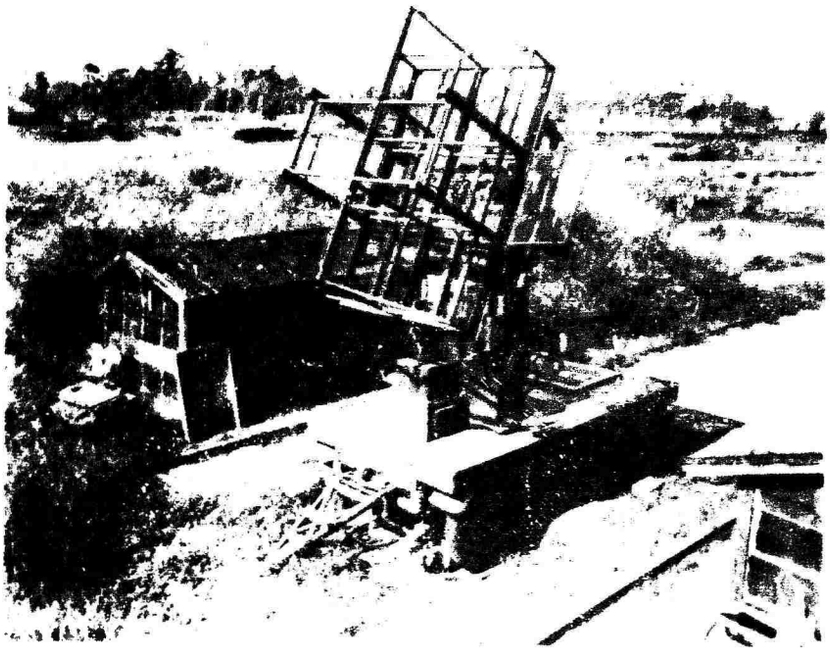
Description:

This gun laying equipment is a mobile unit the transmitting and receiving antennas, while separately operating, are mounted on the same reflector framework. The vertically polarized transmitting dipole sends out a comparatively broad beam. The four receiving antennas are interconnected by a phasing ring so that successive lobes in left and right and up and down directions are generated; these are switched through a 4 segment distributor to the corresponding deflection plates of the azimuth and elevation oscilloscope tubes.

Design ranges of 20 km were readily attained, at times reaching out to 40 km. The elevation accuracy was not as reliable as desired in certain locations. In general Tachi-2 was a satisfactory fire and searchlight control equipment. In the latter stages of the war Tachi-31's were being substituted for Tachi-2's.

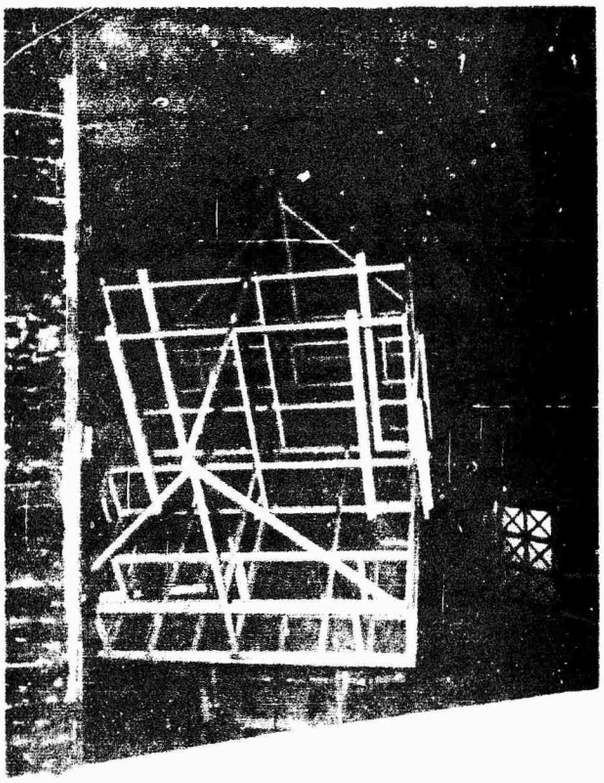
Radar Locator type 2 (Taichi-2)



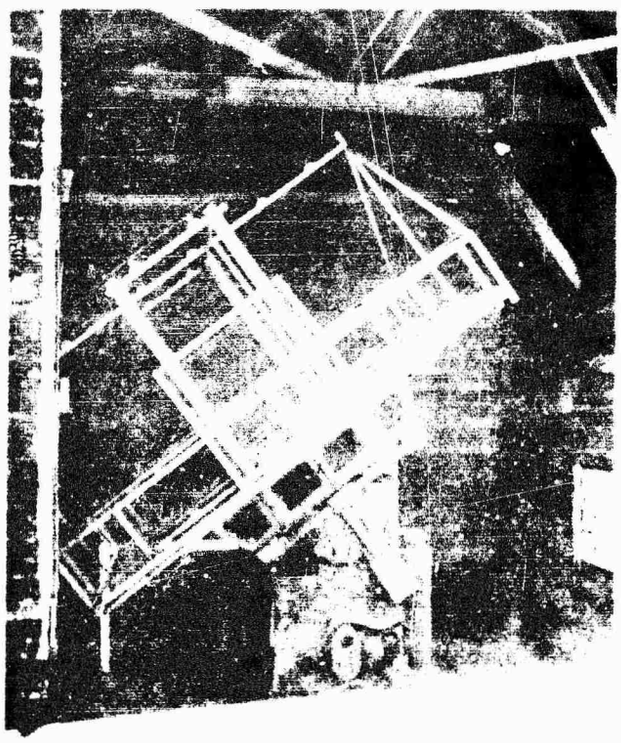


Tachi-2 is sometimes Trailer Mounted

For Camouflage Purposes Tachi-2 May be located In a Barn which Rolls back on Rails when the Set is in Use



Tachi-2 is Found with A Variety of Antennas, some Quite Complex As in This One At Kawasaki (See Aerial Photo in Section I)



TACHI - 3

RADIO LOCATOR TYPE 3

Corresponding Allied Designation: Mark Ta 3.

Technical Characteristics:

f = 78 MC/S. 50 KW. Range 40 Km.
Accuracy: Range, ± 100 M; Azimuth, ± 1°; Elevation, ± 1°.

Number Built = 150. Number Installed = Numerous

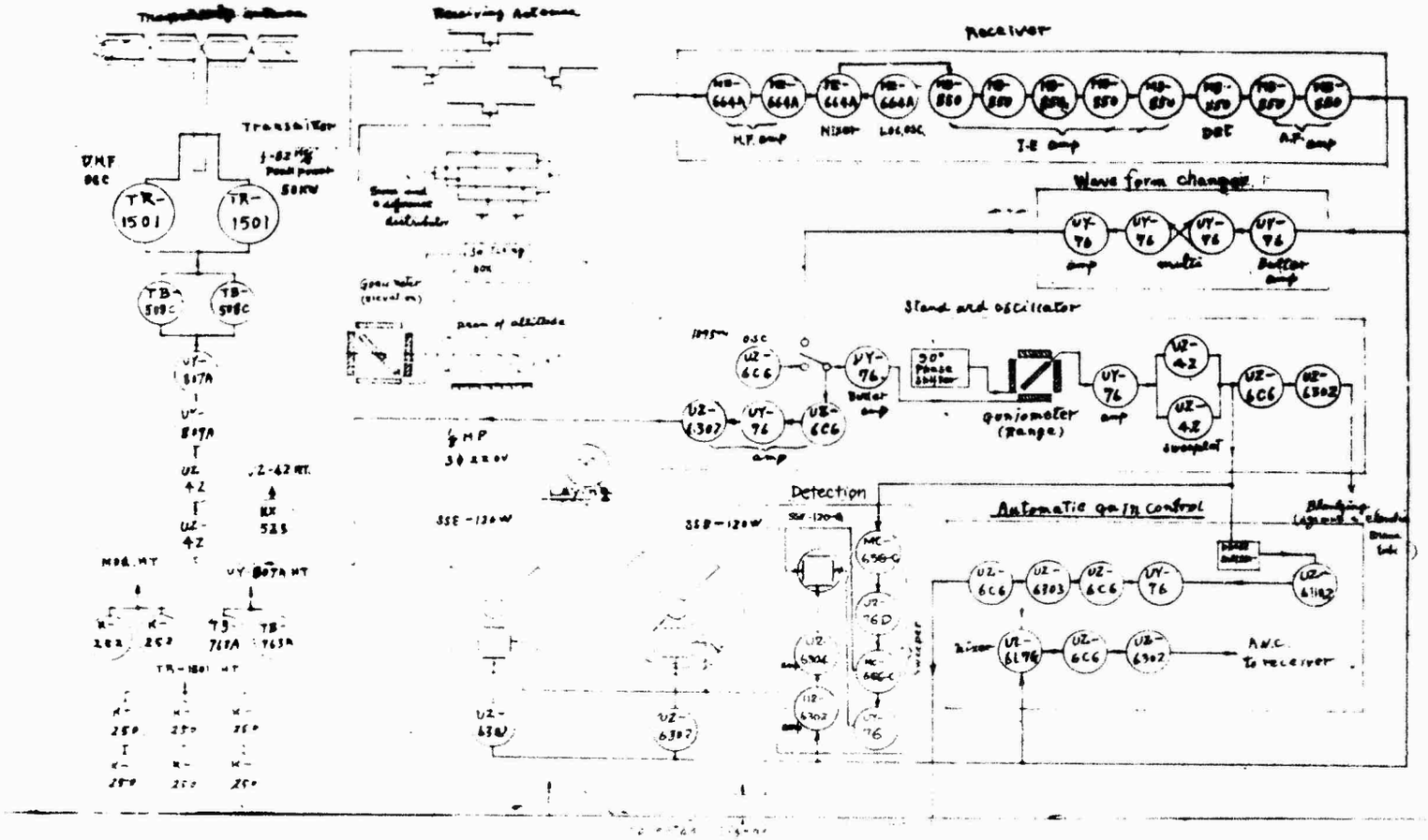
Description:

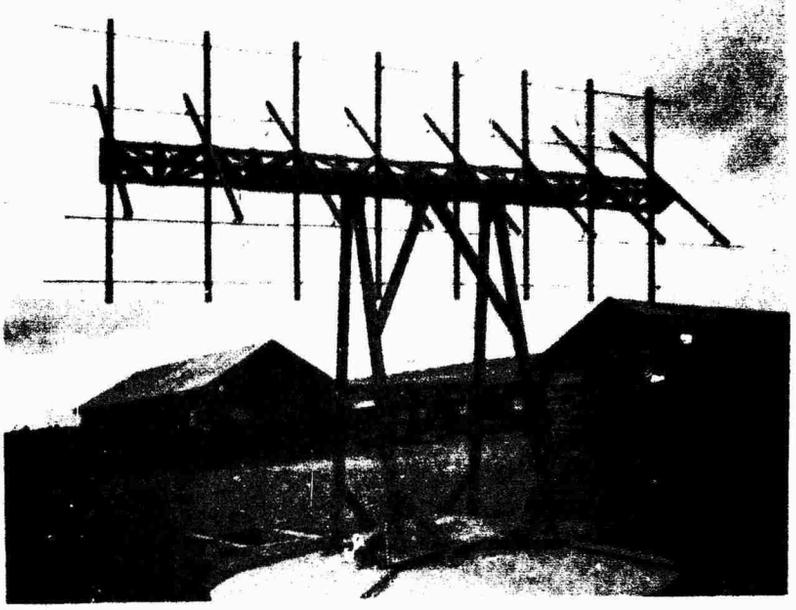
This is a larger and heavier equipment than Tachi-1 or Tachi-2 and was used, only in fixed installations, for controlling both searchlights and guns. The rotating transmitting array was located in a hut separated from the receiving antenna by 50 to 100 yards. The receiving antenna as seen in the photographs lies flat on its back. Azimuth is obtained through horizontal lobe pip matching on a color disk cathode ray tube. Elevation angle is estimated by a goniometer measurement of the phase angle between the signals received on the fore and aft antennas. The positioning is set by matching signal pips on the elevation CRT. A calibrated drum is mechanically coupled with the elevation and range goniometers and permits a direct reading of the altitude of the plane being tracked.

A feature of this set not found in many others is an automatic gain control circuit in the receiver.

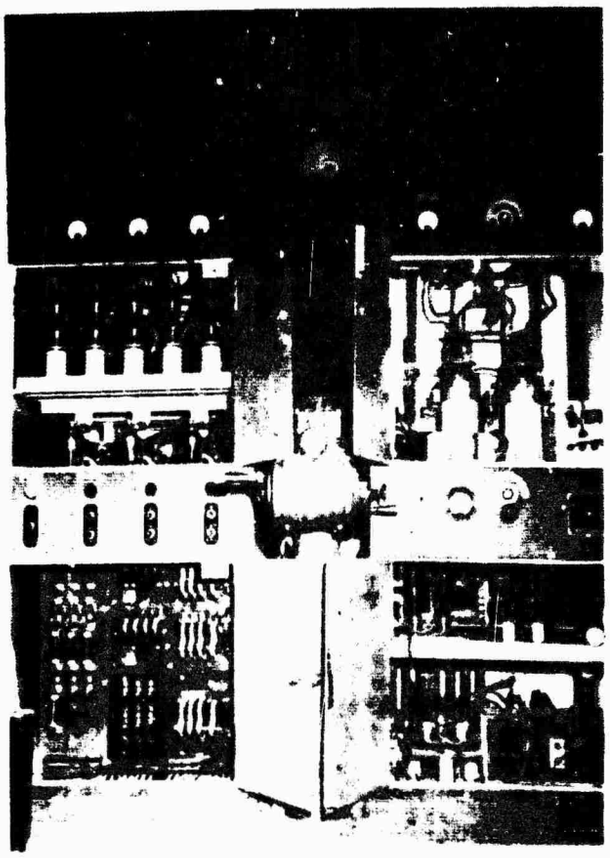
Tachi-3 was the main reliance of the army for accurate fire and searchlight control.

Tachi-3 was tested by the navy at their field laboratory at Chigasaki and although found to have longer range than their fire control equipments, it did not give as good azimuth and elevation accuracy.

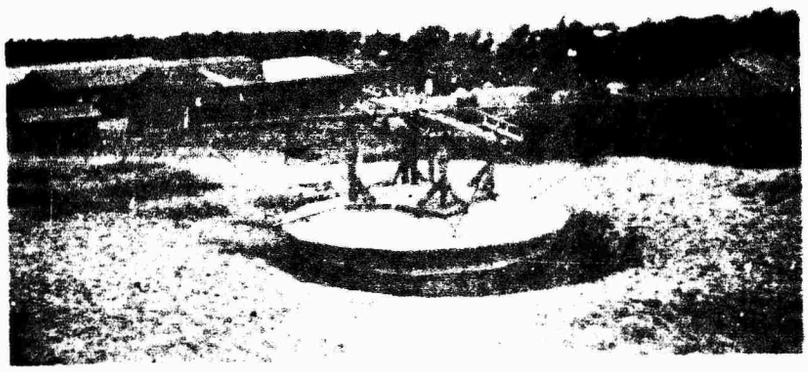

Receiver
Wave form changer
Stand and oscillator
Detection
Automatic gain control
Transmitter
TR-1501
TR-1501
Receiving Antenna
Gyro unit
Beam of altitude
Gyro unit
Beam of altitude
Gonjometer (Range)
30° Phase shifter
Sweeper
Blanking
A.V.C. To receiver
UY-BOTA MT
UZ-42 MT.
MOD. MT
TR-1501 MT



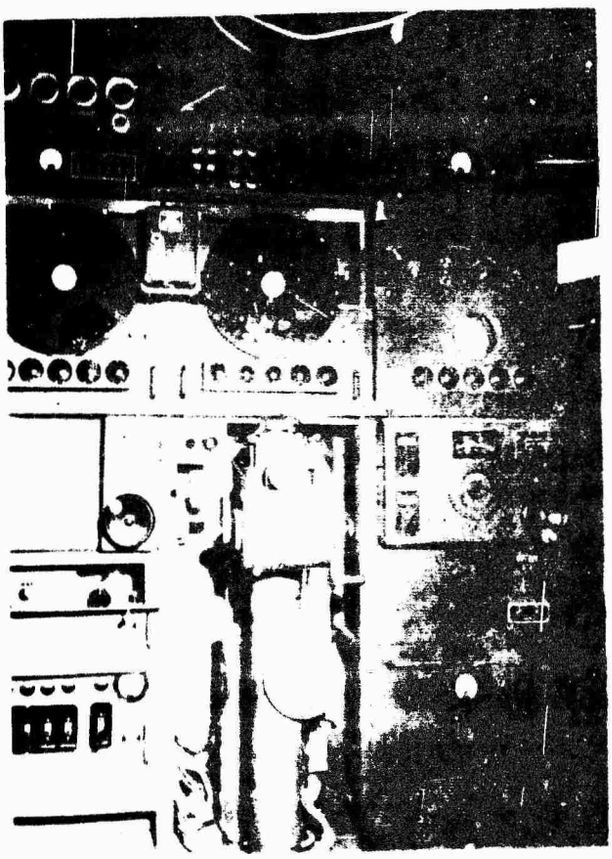
Tachi-3 Transmitting Antenna - Chigasaki.



Close up Interior View of Tachi-3 Transmitter.

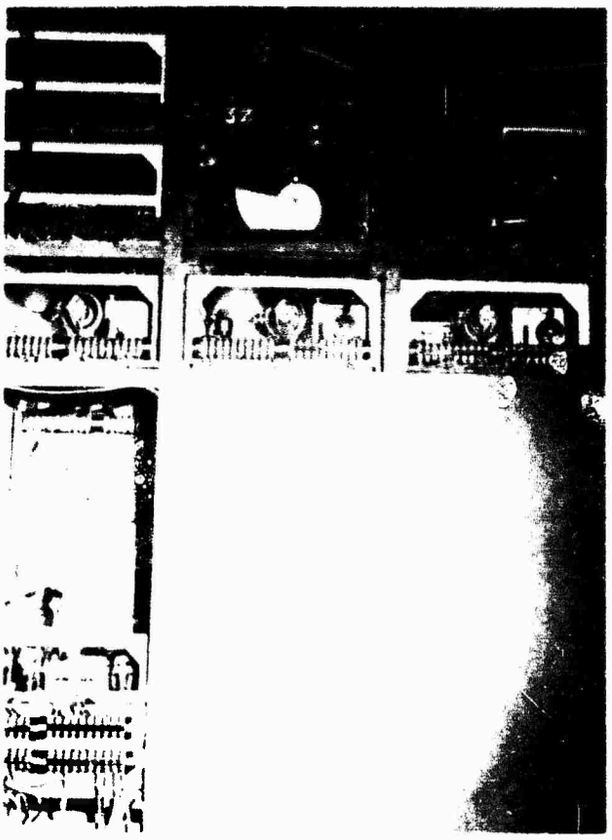


Tachi-3 Receiving Antenna - Chigasaki.



Front View of Tachi-3 Receiver

Note Color Disks.



Rear View
of Tachi-3
Receiver.

TACHI - 4

RADIO LOCATOR TYPE 4

Corresponding Allied Designation: Mark Ta 4.

Technical Characteristics:

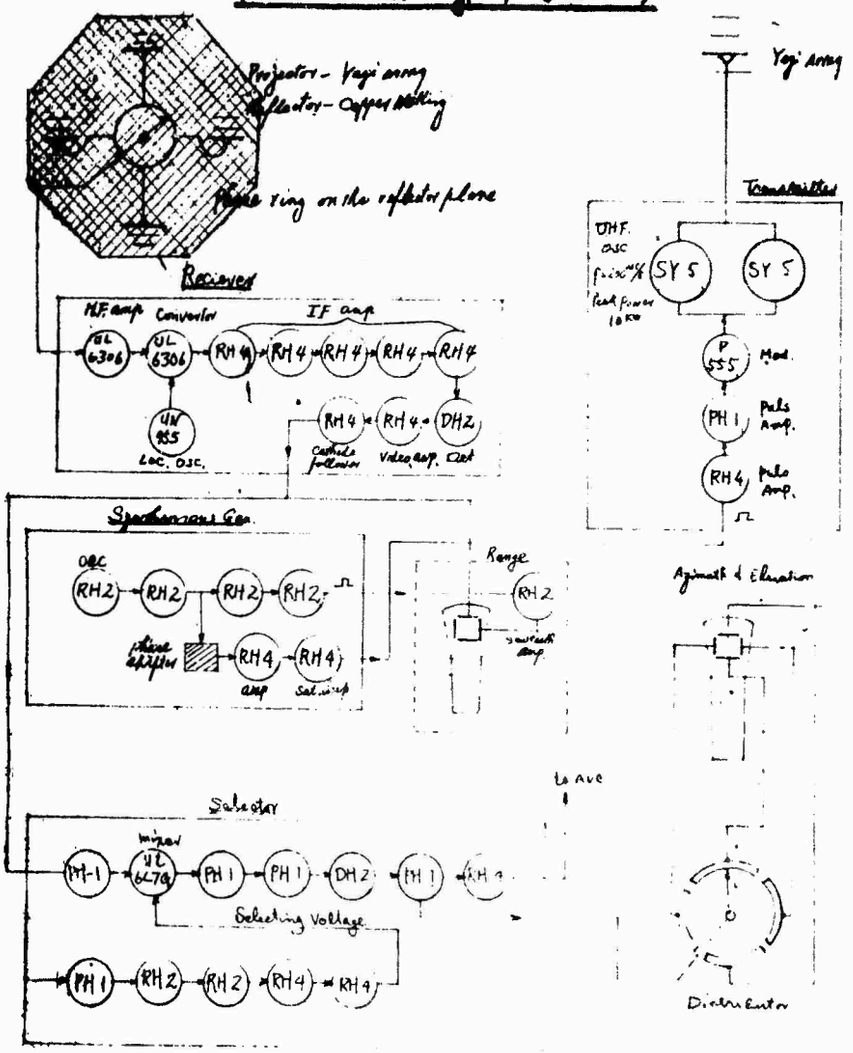
f = 200 MC/S. 10 KW. Range 40 Km.
Accuracy: Range, ± 100 M; Azimuth, ± 1°; Elevation, ± 1°.

Number Built = Number Installed =

Description:

Tachi 4 was a medium weight set designed to give increased performance over Tachi-1 and -2 for fire and searchlight control. The result was disappointing since only about half of the expected 40 km range was obtained. Moreover the angular accuracy was poorer than either Tachi-1 or -2. Hence the set was used to fill in the warning in otherwise dead zones in mountainous areas, and for searchlight control. As the war ended studies were being made to improve the antenna, which used a separate Yagi mount for transmitting and a group of 4 receiving Yagis mounted on an octagonal shaped screen carried by a trailer; receiver take off from the antennas was through a phasing ring. An A-scan CRT permitted the selection of any target, whose echo was then displayed on a combined azimuth and elevation scope by means of a 4 segment distributor.

Radio Locator "type 4" (Tachi 4)



TACHI - 31

RADIO LOCATOR MODIFIED TYPE 4

Corresponding Allied Designation: Mark Ta Model 4 (probably).

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 40 Km.
Accuracy: Range, ± 100 M; Azimuth, ± 1°; Elevation, ± 1°.

Number Built = 70. Number Installed = "only a few"; a new set which was still undergoing development.

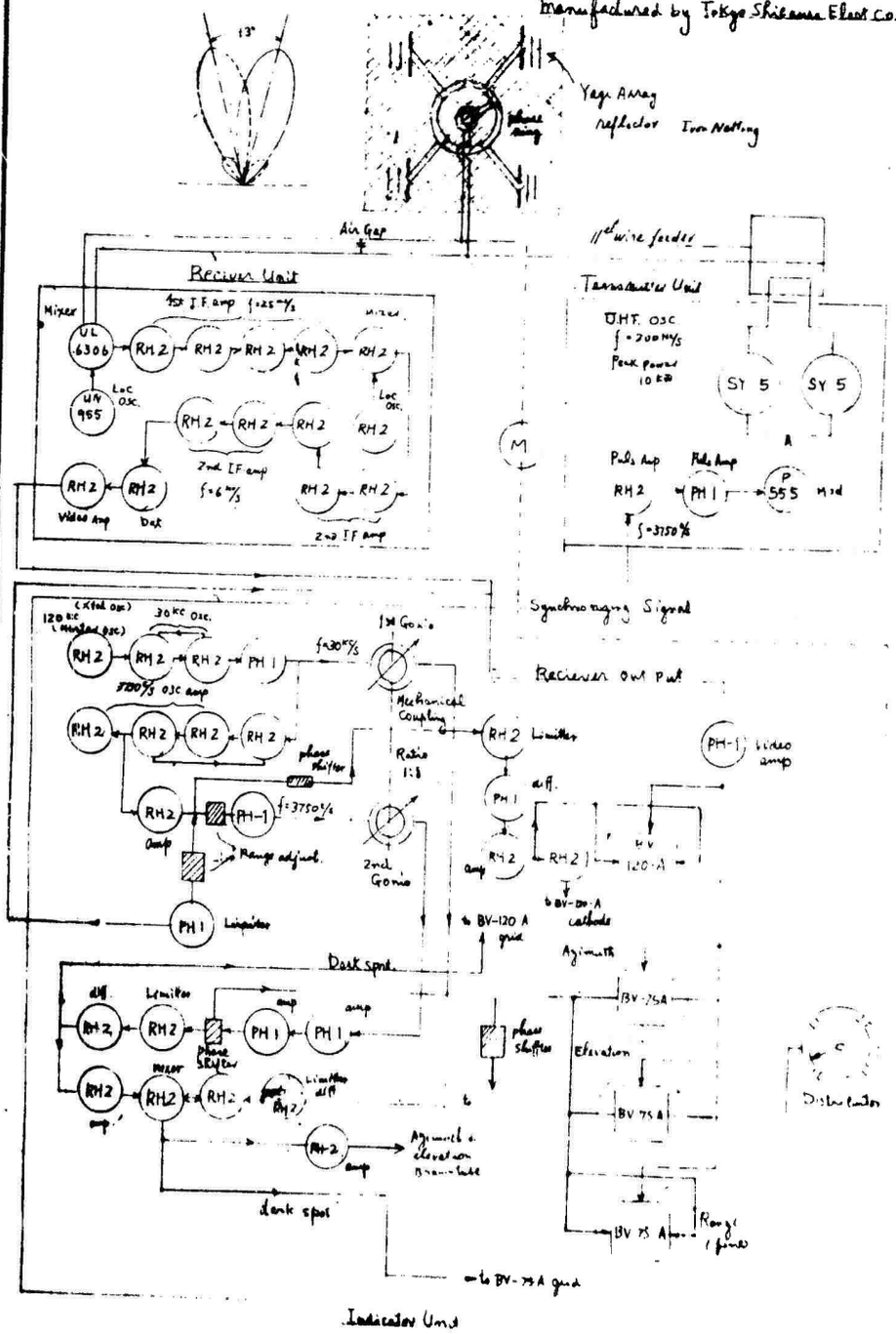
Description:

Tachi-31 was developed to provide improved performance over Tachi-1, -2, and -4, the lightweight locators. Unlike its predecessors it uses the same antenna for transmitting as receiving to get more overall antenna gain in the particular off-center angle at which the lobe is pointing at any instant as regulated by the position of the connection of the transmission line to the antenna phasing ring. As indicated on the block diagram the lobe can be swung in a circle 6½° off center. A four scope presentation is used; coarse range, fine range, azimuth pip matching, and elevation pip matching.

Preliminary results with this set indicated tracking ranges of 18-25 km, and the relatively good accuracies in azimuth and elevation of ± 1°. It was to have become the standard army radar locator.

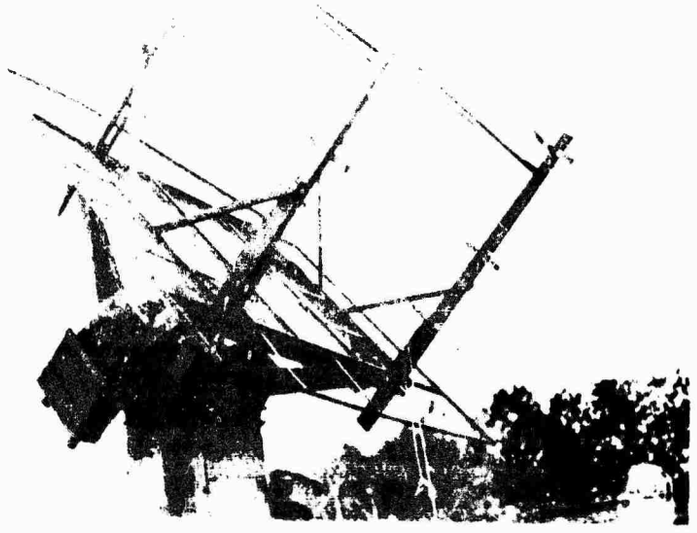
Radio Locator "Modified type-4" (Tachi-31)

Manufactured by Tokyo Shibaura Electr Co.



Tachi-31's Trailer Mounts both Equipment and Antenna

Kodaira School.



Detail of Tachi-31 antenna.

TACHI - 24

RADIO LOCATOR WURZBURG TYPE

Corresponding Allied Designation: None.

Technical Characteristics:

Wavelength = 50 cm. 10 KW. Range 40 Km.
Accuracy: Range, ± 40 M; Azimuth, ± 1/8°; Elevation, ± 1/8°.

Number Built = 3. Number Installed = 0.

Description:

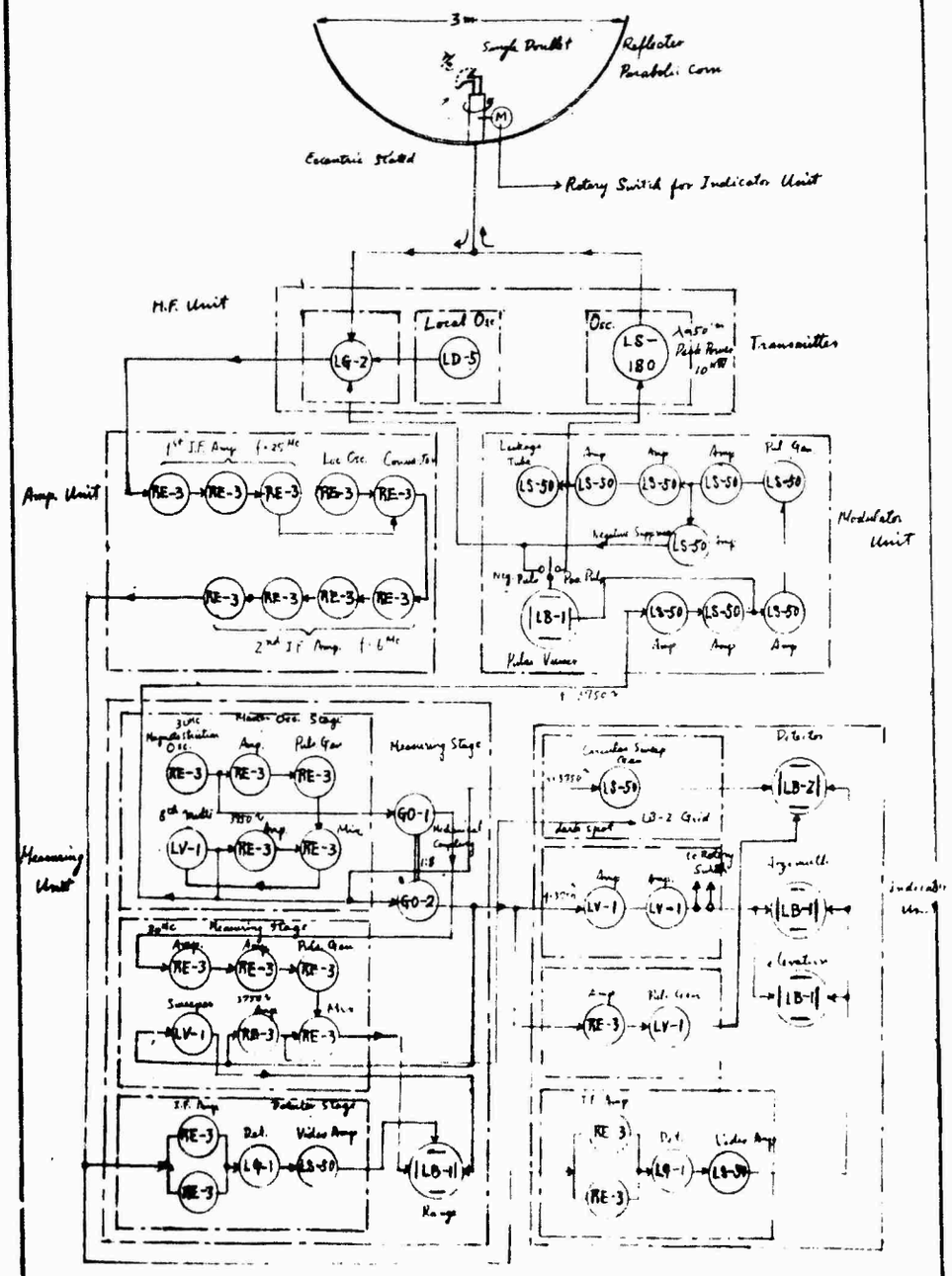
This set was as close a copy as the Japanese firm Nihon Musen could make of the German Small Wurzburg 50 cm gun laying radar. Complete blue prints and certain very special parts including the vacuum tubes were brought over from Germany by submarine in January 1944. Although it is rumored that as many as 20 technicians came with the plans to help on its production, only one German engineer, a Mr. Foders, can actually be identified. It was decided that Nihon Musen would re-engineer the set to Japanese specifications and build three initial sets, two of which would be sent to the Sumitomo and Tokyo Shibaura companies for them to use as models for large scale production. An initial order of 50 was said to have been placed. There is some difference of opinion between the army engineers and the manufacturer as to which was primarily responsible for their requiring 18 months to get the first model built. In any case, these first sets never were operated, largely because certain items such as the CRTs which were to have been supplied by Sumitomo and Shibaura were unavailable, those companies' plants having been badly bombed. The manufacturers stated that "if the war had lasted only one more month" they'd have had a Tachi-24 in operation.

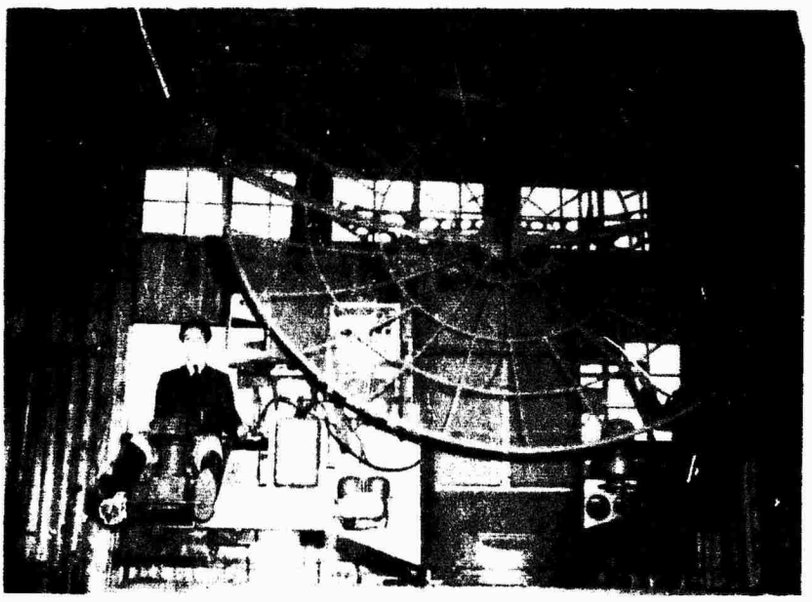
If the Japanese had had this set 6 months earlier with its vastly superior tracking accuracy the effectiveness of their AA defense might have been very greatly increased resulting in a much heavier loss to our B-29 aircraft.

The photos show the first and most nearly completed models of the Tachi-24 set in a barn near Mitaka, Tokyo area.

Radio Locator "Wurzburg" type (Taiki-24)

manufactured by Nippon Muson





Front View of Japanese Made Wurzburg, Tachi-24 - Nihon Musen Factory, Mitaka.

Rear View of Tachi-24.

TAKI - 2

AIRPLANE RADIO LOCATOR

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 80 cm. 2 KW. Range against: aircraft, 5 Km; ships, 8 Km.
Accuracy: Range, ± 200 M; Azimuth, ± 1°.

Number Built = A small number

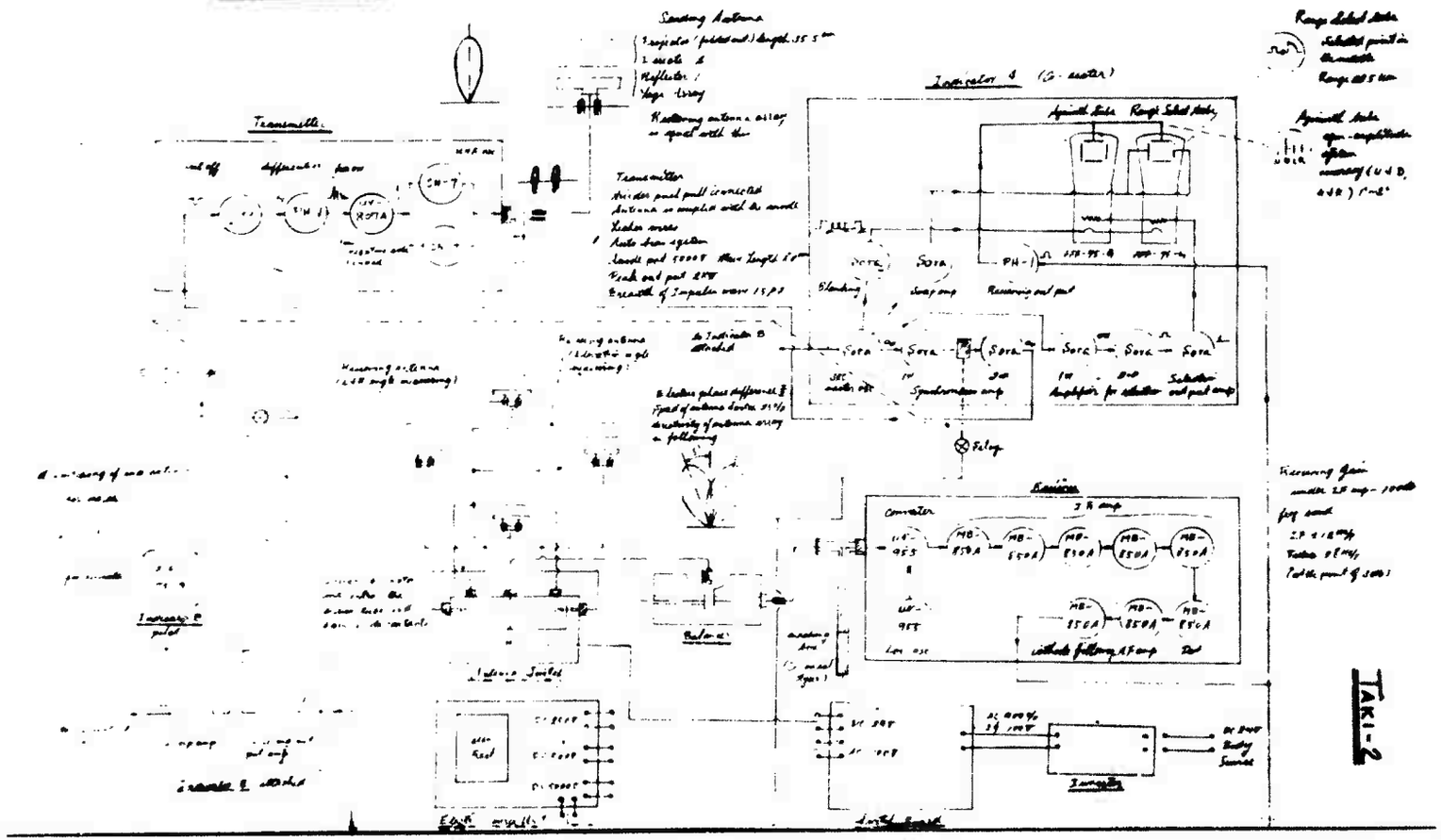
Number Installed = still under test.

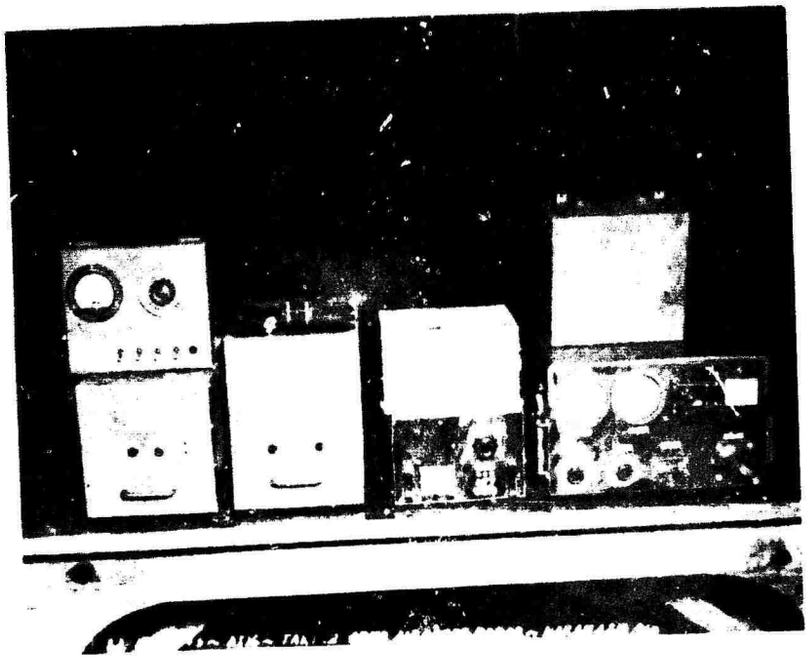
Description:

This was the first army AI (air interception) radar built and bears a strong resemblance to the American SCR-540 equipment. The set is for a 2 place airplane. It uses a Yagi array with folded dipole for a nose installed transmitting antenna, and a pair of antennas on either side of fuselage for azimuth estimation and another vertically spaced pair for elevation estimation. A motor driven distributor connects the receiver to each antenna in rapid succession. The display is unique in that one tube is used for ranging (A-type) and another tube shows Up-Down signal strengths on the left half and Left-Right signal strengths on the right half, as suggested in the block diagram. A remote indicator for the pilot duplicates this second display; a meter operated by selsyn control from the indicator unit gives him the range of the target selected for viewing by the radar operator.

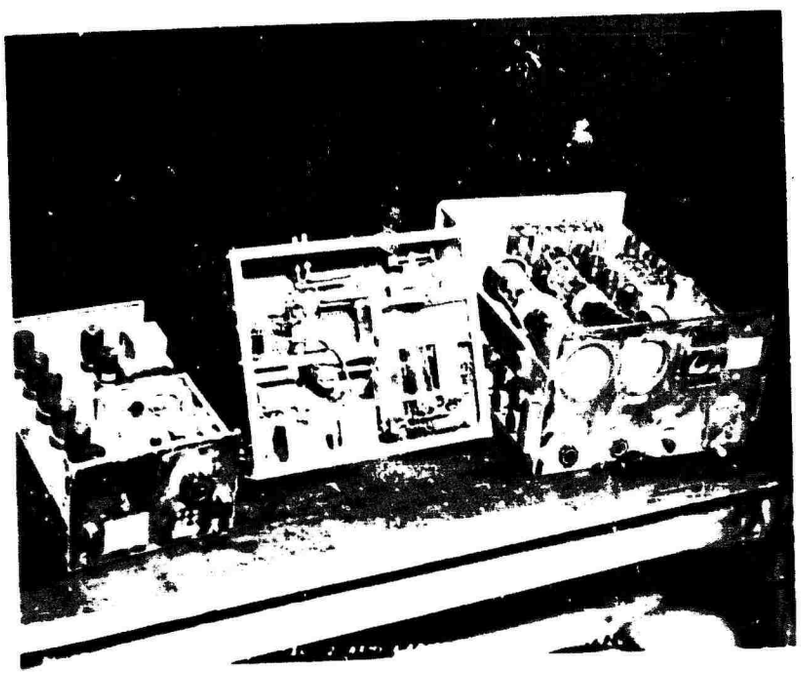
Model II of Taki-2 was undergoing tests on night fighters at the time the war ended; studies were being made on a Model III which would have an improved indicator.

Aeroplane Radio Locator (TAKI-2)





Bench Set up of Taki-2 Airborne Radar.



View of Interior of Taki-2 Components.

TACHI - 13

GROUND PART OF FRIEND LOCATOR

Corresponding Allied Designation: ----

Technical Characteristics:

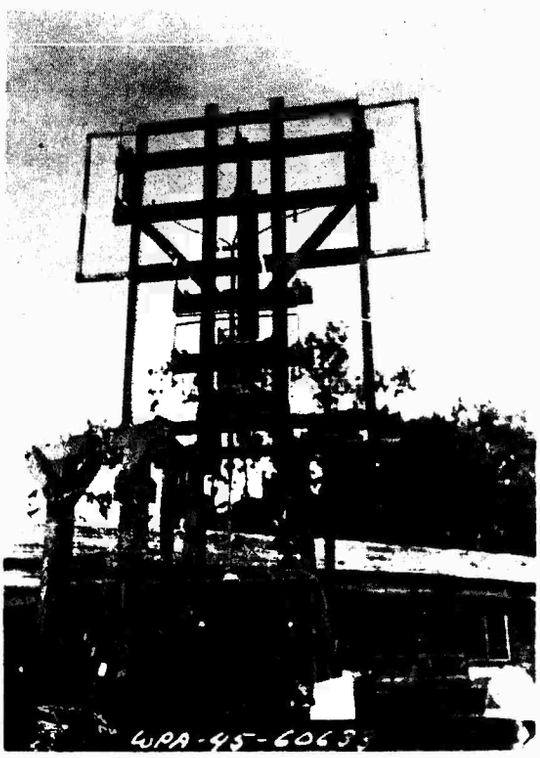
Transmitter f = 184 MC/S. 10 KW. Receiver f = 175 MC/S. Range 150 Km.
Accuracy: Range, ± 500 M; Azimuth, ± 1°.

Number Built = 20. Number Installed = *FEN*

Description:

This is essentially the ground end of a GCI system by which a controller can at all times keep accurately informed of the location of a friendly interceptor. The ground station is really an interrogator for the Taki-15 IFF set carried in the plane. The interrogating frequency is 184 MC/S, while the plane replies at 175 MC/S. This insures that only the friendly airoraft's signal will appear on the indicator.

The transmitter sends out a single lobe broad pattern, while accurate azimuth is obtained by lobe switching the receiving antenna pattern. Range and azimuth scopes are provided; echo heights being matched on the latter. The first equipments were just being installed and ground crews were undergoing instruction at the end of the war.

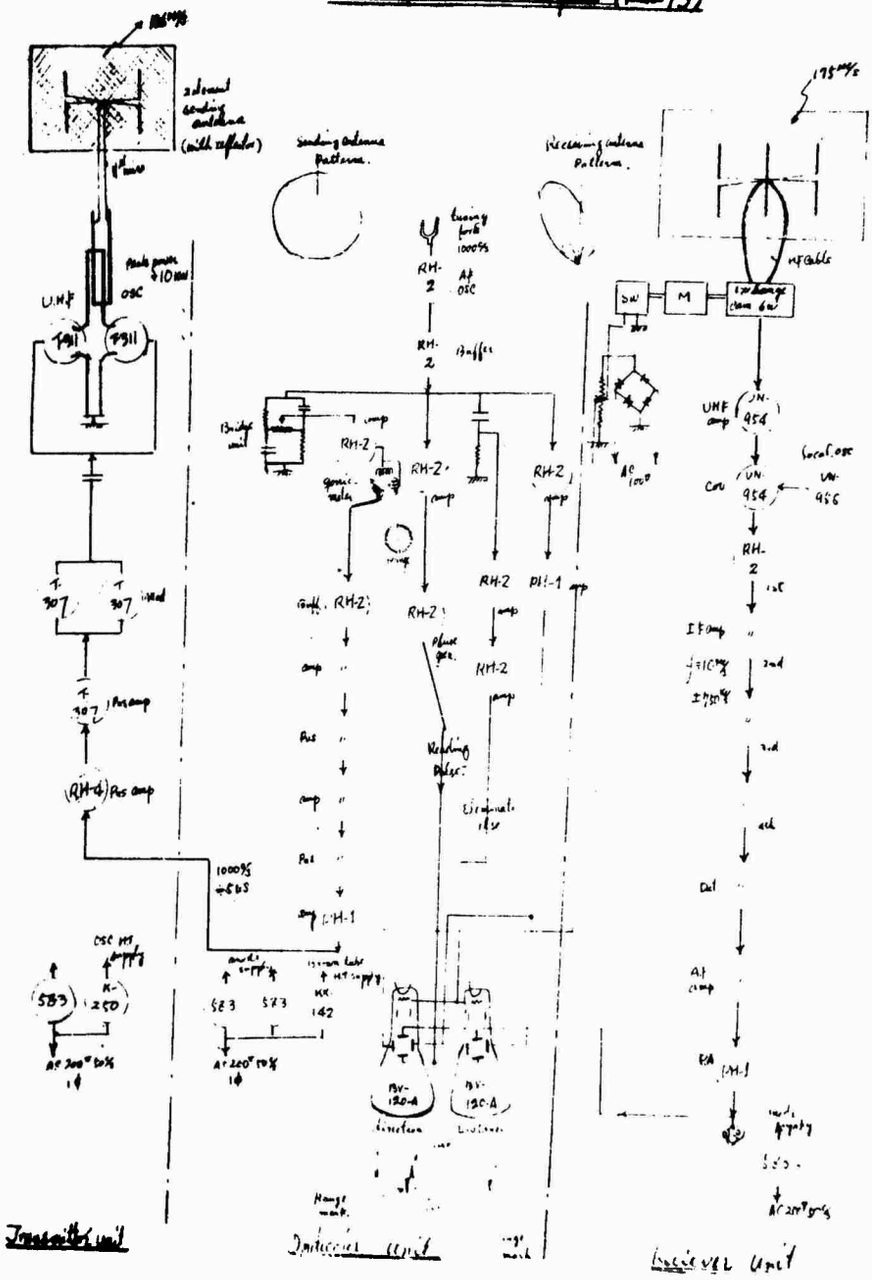


Tachi - 13
Transmitting
Antenna (Lower)

and

Receiving
Antenna (Upper)

Friend locater on the ground (Tachi-3)



TAKI - 15 TYPE I

AVIATION PART OF FRIEND LOCATOR

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter f = 175 MC/S. 100 W. Receiver f = 184 MC/S. Non-directive.

Number Built = 50. Number Installed = FEW

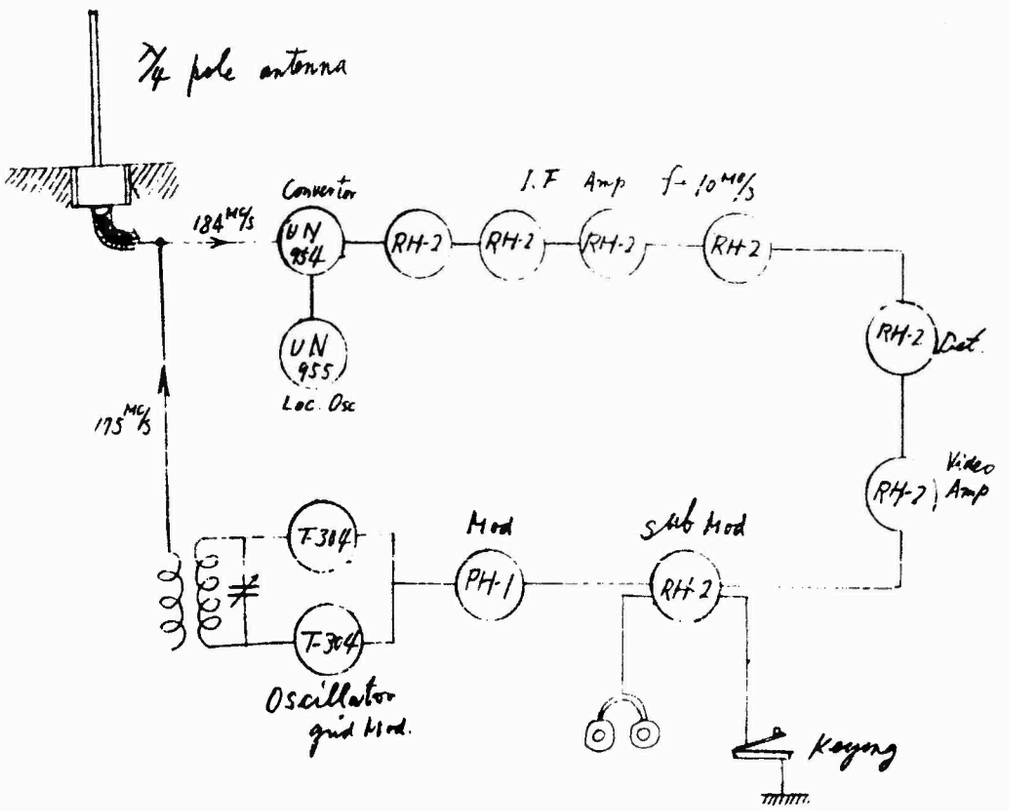
Description:

Taki 15 is the Japanese army's IFF set and is a small beacon carried by the aircraft, receiving on 184 MC/S and responding at 175 MC/S. Headphones and a key are provided and with similar equipment at the ground end (Taohi-13) two-way Morse communication can be carried on. In the rudimentary fighter control techniques being worked out this channel was used for passing homing information but not for interception instructions.

See Taki-15, Type II for the refined version of this set, which uses lecher line tuning, and a T-R discharge tube to protect its receiver.

Aviation part of Friend-locator "Taki-15 type I"

(Repeater)



TACHI - 28

LOCATE - LEADER

Corresponding Allied Designation: ----

Technical Characteristics:

f = 190 MC/S. Range 300 Km. Signal relay f = 50-65 MC/S. 8 W.

Number Built = 1. Number Installed = 1 (being tested).

Description:

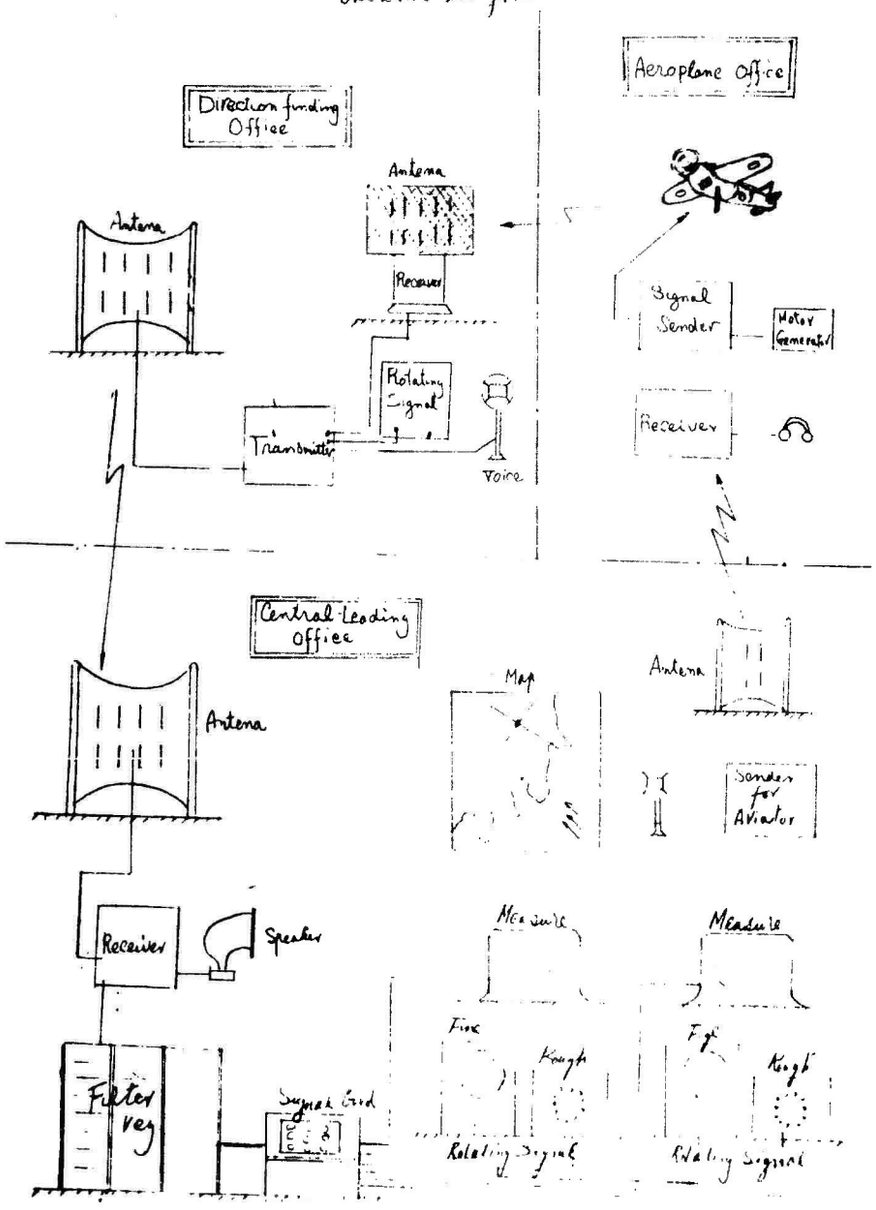
Tachi-28 is the name of a complete ground equipment system (the associated airborne equipment is Taki-30) which will provide reasonably accurate data on the current positions of up to 30 independently controlled aircraft. Each airplane to be controlled carries a transmitter (Taki-30) radiating a continuous signal on 190 MC/S modulated at some assigned frequency between 30 and 60 kc. Two or more DF (direction finder) stations located at intervals of about 50 miles pick up the signals. Their antennas rotate steadily at 2 rpm, and each is arranged by 50 cycle lobe switching to have a horizontal pattern with two maxima and a sharp minimum between them.

The composite signal picked up by each DF station--a mixture of tones from 30 to 60 kc--is radioed to a control station on a special 5 meter link. In the region below the lowest aircraft signal frequency (from 0 to 30 kc) a voice channel and an azimuth signal are transmitted. The latter indicates the position of the DF antenna and is in two parts: one, for fine data, is continuously variable and repeats itself every 30°; the other, for coarse data, varies in 12 steps. At the central station the coarse azimuth signal lights one of 12 neon lamps, while the fine azimuth signal positions the spot of a cathode ray tube, causing it to go through a circle for each 30° of the DF antenna's travel. The signal of the particular plane being observed is selected by a filter and displayed radially on the cathode ray tube. Because of the double-lobe pattern of the DF antenna the observed figure will be like that shown on the scope of the diagram for the "Control Leading Office"; the minimum in the center of the figure is at the azimuth of the plane. The operator locating a plane has two such scopes before him, one for each of two outlying DF stations. From the data of both stations he can locate the plane quite accurately. Other operators use the same azimuth signals but select different aircraft signals.

This system is of interest in that it provides instantaneous remote indication of a large amount of data: 2 DF outs a minute on each of 30 airplanes. It was intended for GCI use and a large system was being installed in the Tokyo area. The central station was located at Matsudo; initial DF-ing stations were at Choshi and Shirahama, 50 miles east and south, respectively, of Tokyo. In some cases relay stations were to be used in the 5-meter radio link. This grand scale project was interrupted by the ending of the war.

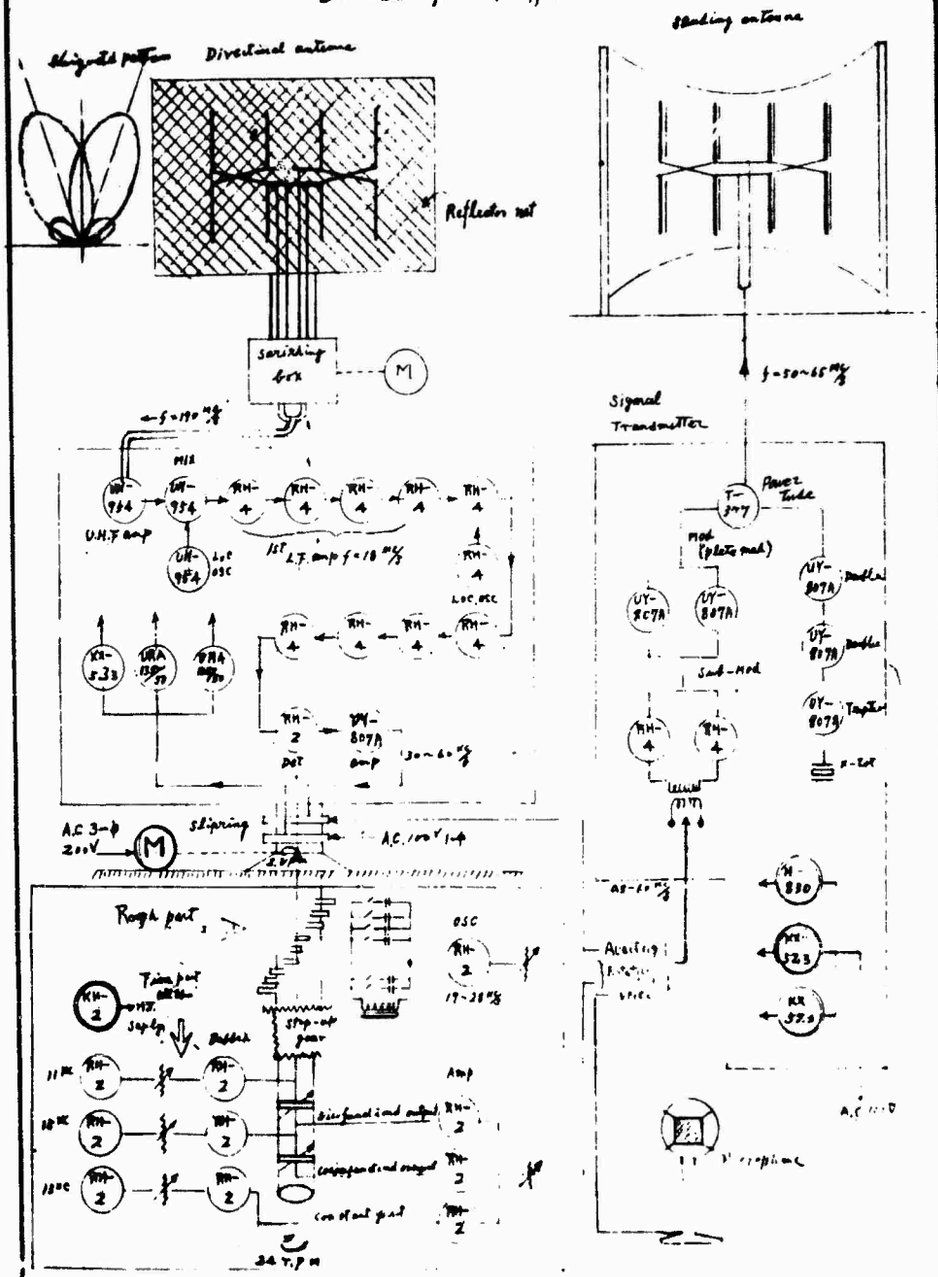
Locate-Leader (Tachi-28)

Outline Diagram



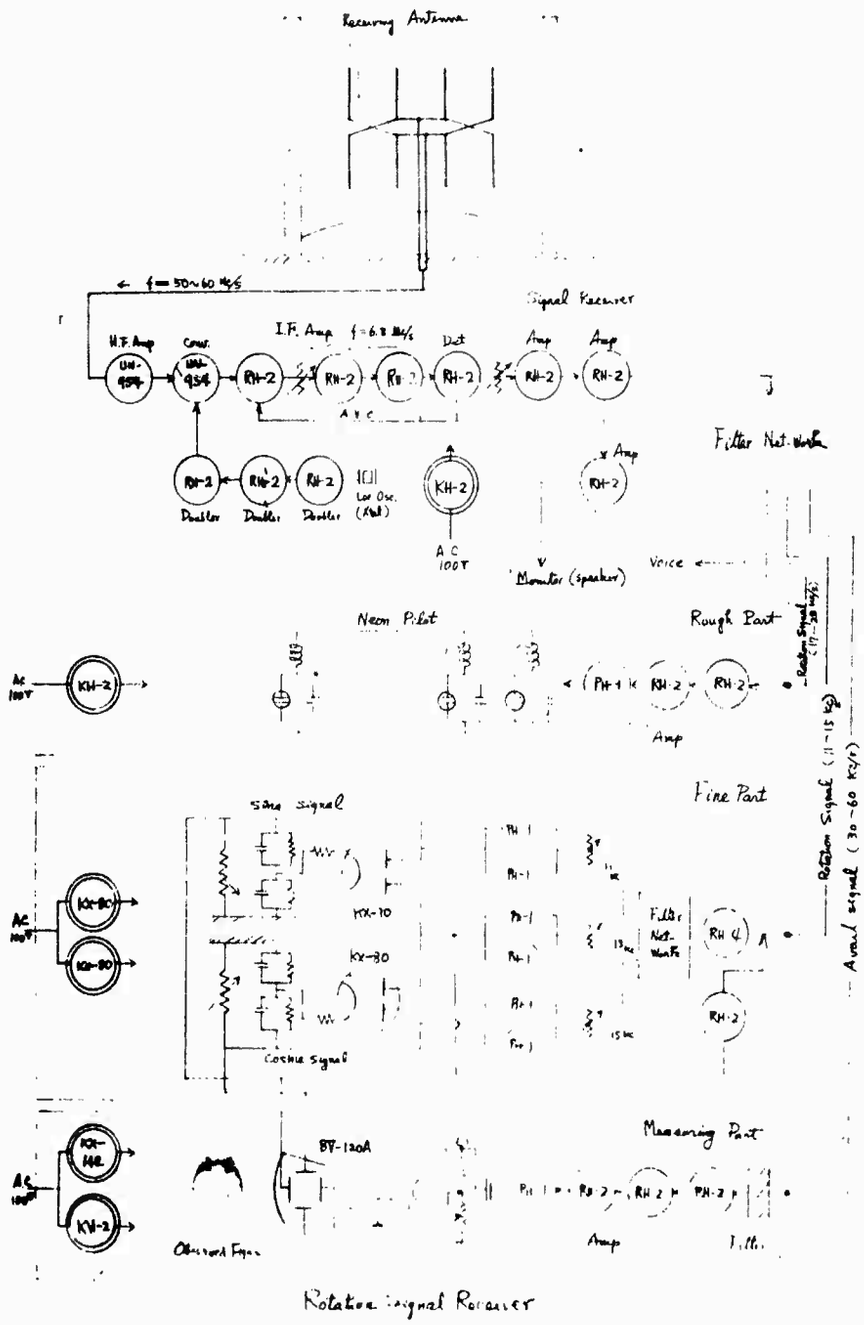
Locate-Leader (Prof.-28)

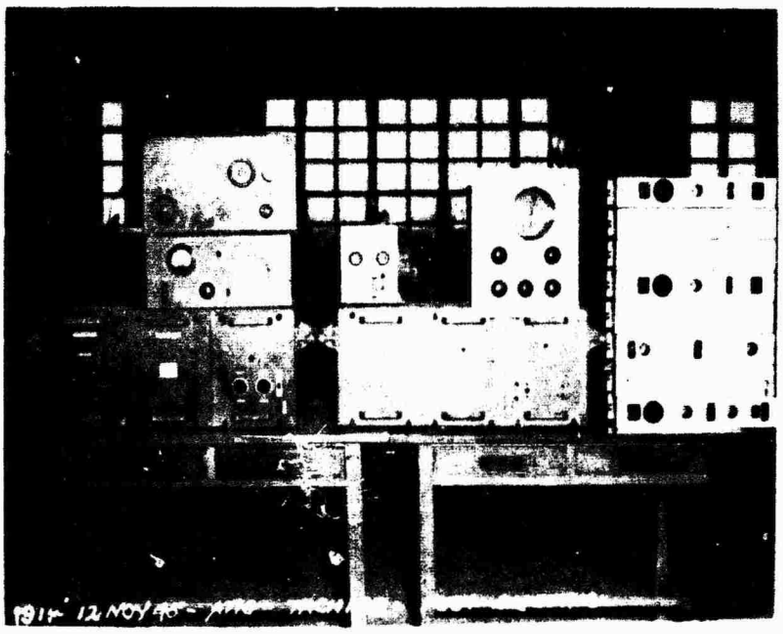
Direction-finding office



Locate-Leader (Taishi-28)

measuring parts : Central-Leading office).



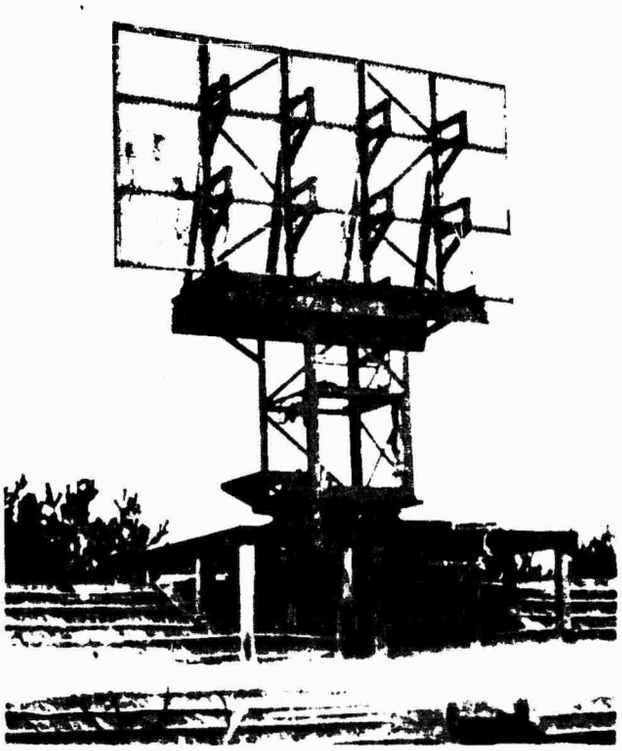


Tachi-28 Central Station Equipment

Left: Fine Indicator, Coarse Indicator, Auxiliary Equipment

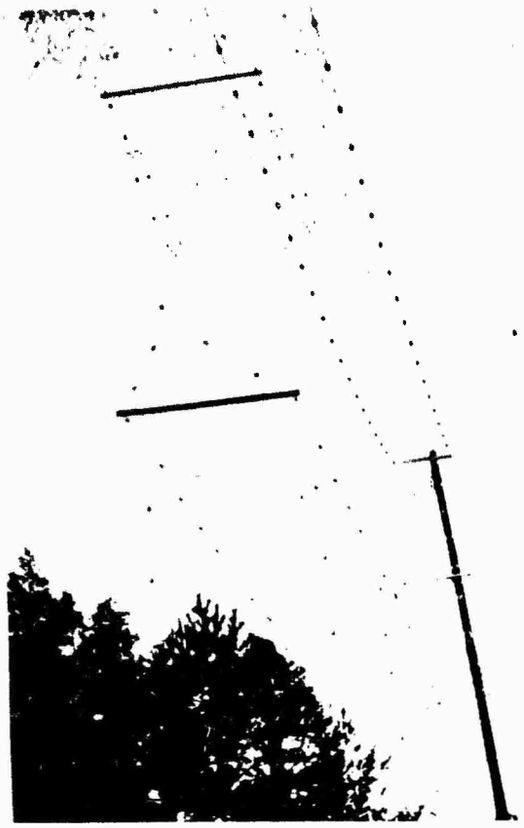
Center: Monitor Scope, Equipment to Develop Circular Sweep

Right: Filters for Airplane Signals



Tachi-28

D/F Antenna



Tachi-28
5-meter
relay
link
array

TAKI - 30

LOCATE-LEADER - AVIATE PARTS

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter f = 190 MC/S. CW 20 W. Modulation f = 30-60 KC/S (1 KC/S steps). Non-directive.

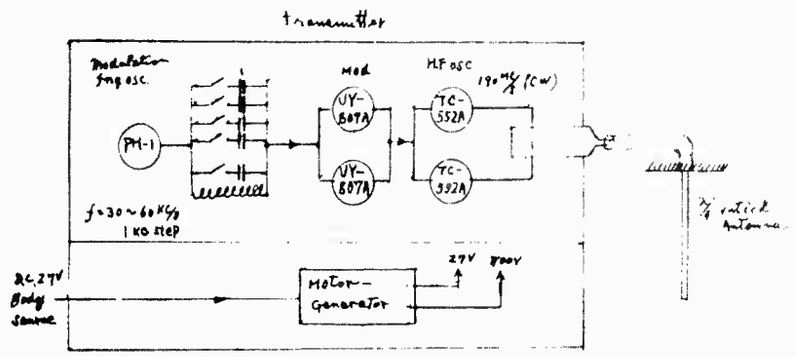
Number Built = 50. Number Installed = a few for test.

Description:

Taki-30 is the small transmitter carried by the interceptor airplane to indicate to the ground system (Taehi-28) its accurate location. It sends out a continuous signal at 190 MC/S modulated by a choice of signals in 1 kc steps between the limits of 30 and 60 kc. Thus 30 different planes, each with a different modulating frequency, can be individually controlled simultaneously.

Locate-Leader (Taki-30)

Aviate parts



TACHI - 36

ORDER APPARATUS FOR DEFENSIVE-ATTACK-COMPUTER AND TRANSMITTER

Corresponding Allied Designation: ----

Technical Characteristics:

Accuracy of Computation: Bearing, ± 2°; Range, ± (30 sec x cruising speed).
Accuracy of Transmission: Bearing, ± 5°; Range, ± 200 M; Altitude, ± 500 M.

Number Built = 1 under test. Number Installed = 1.

Description:

Tachi-36 is first an electrical computing device in which is inserted the present course and speed of the foe plane and of the friendly plane. From it comes the proper course for the friendly plane to fly to effect an interception; the distance to fly to that point is also given. The remaining part of Tachi-36 is a transmitter with controls on which the operator sets up the correct course to fly (azimuth) as just determined, the distance yet to go (range) and the altitude to come in at. These three pieces of data are transmitted through three sectors of a rotating contactor, each contact of which is associated with a different low audio frequency modulating a radio transmitter. A corresponding rotary arrangement with tuned reeds is installed in the plane and when the rotating electromagnet carrying the demodulated radio frequency passes the proper tuned reed it sets the latter in violent vibration. These are marked with proper course, range, and altitude scales so that the pilot can at a glance tell the proper next move to make. The rotating elements are kept in step by a synchronizing signal sent once a second at the start of each revolution.

Order apparatus for defensive-attack
"counting apparatus"

Taoki-36.

principle

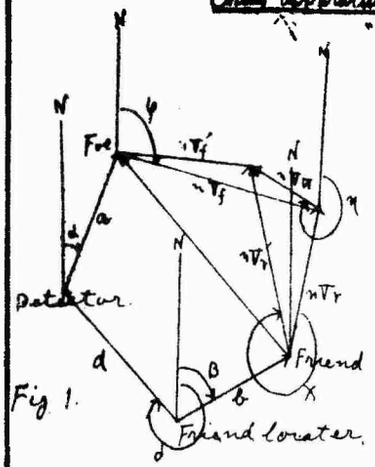


Fig. 1.

V_f ---- velocity of foe-plane

V_f' ---- velocity of foe-plane (corrected the wind velocity)

V_r ---- velocity of friend-plane (in windless condition)

V_w ---- wind velocity

$$V_r \sin X = \frac{1}{n}(a\sin\alpha + d\sin\delta - b\sin\beta) + V_f \sin\varphi + V_w \sin\eta \quad \cdots (1)$$

$$V_r \cos X = \frac{1}{n}(a\cos\alpha + d\cos\delta - b\cos\beta) + V_f \cos\varphi + V_w \cos\eta \quad \cdots (2)$$

$\frac{1}{n}(a\sin\alpha - b\sin\beta)$ is calculated by the circuit of Fig. 2.

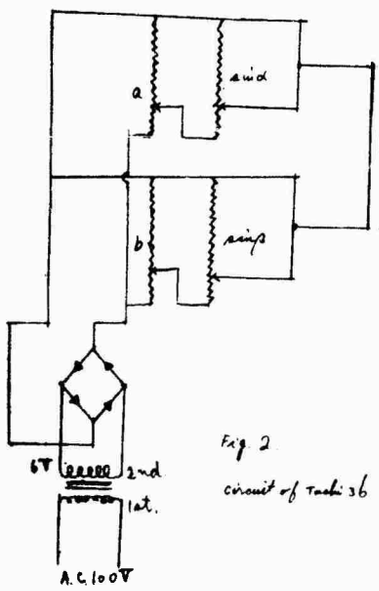


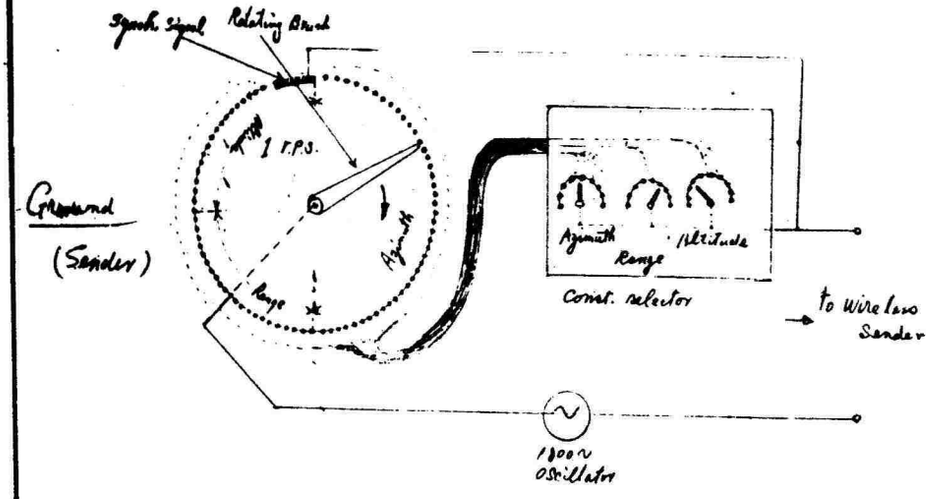
Fig. 2
circuit of Taoki 36

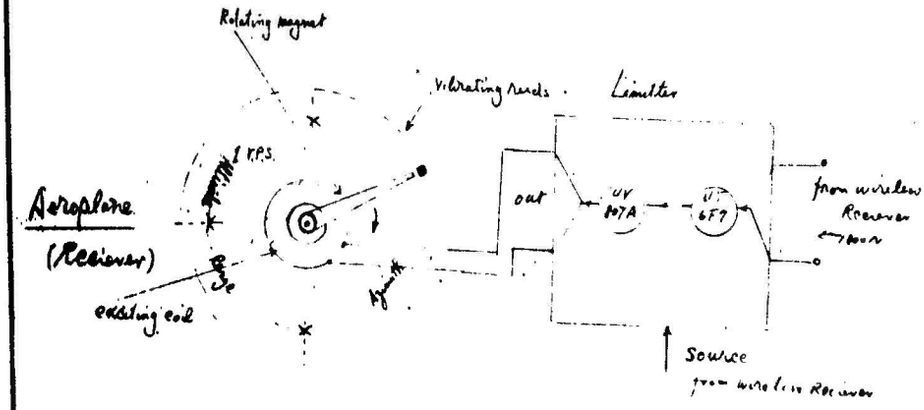
Other calculation was obtained in same way. From calculation (1) and (2) the direction that friend fighter mount, and the distance between the present and the future meeting position of friend are obtained

Order apparatus for defensive - attack

"Transmittin of required terms"

Indication	Accuracy
Azimuth	± 5°
Altitude	± 500m
Range	± 200m max.





TACHI - 17 TYPE I

IDENTIFICATION OF FRIEND GROUND PART

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter f = 184 MC/S. 10 KW. Receiver f = 175 MC/S. Range 250 Km.
Accuracy: Range, ± 3 Km; Azimuth, ± 3°.

Number Built = 50. Number Installed = 0.

Description:

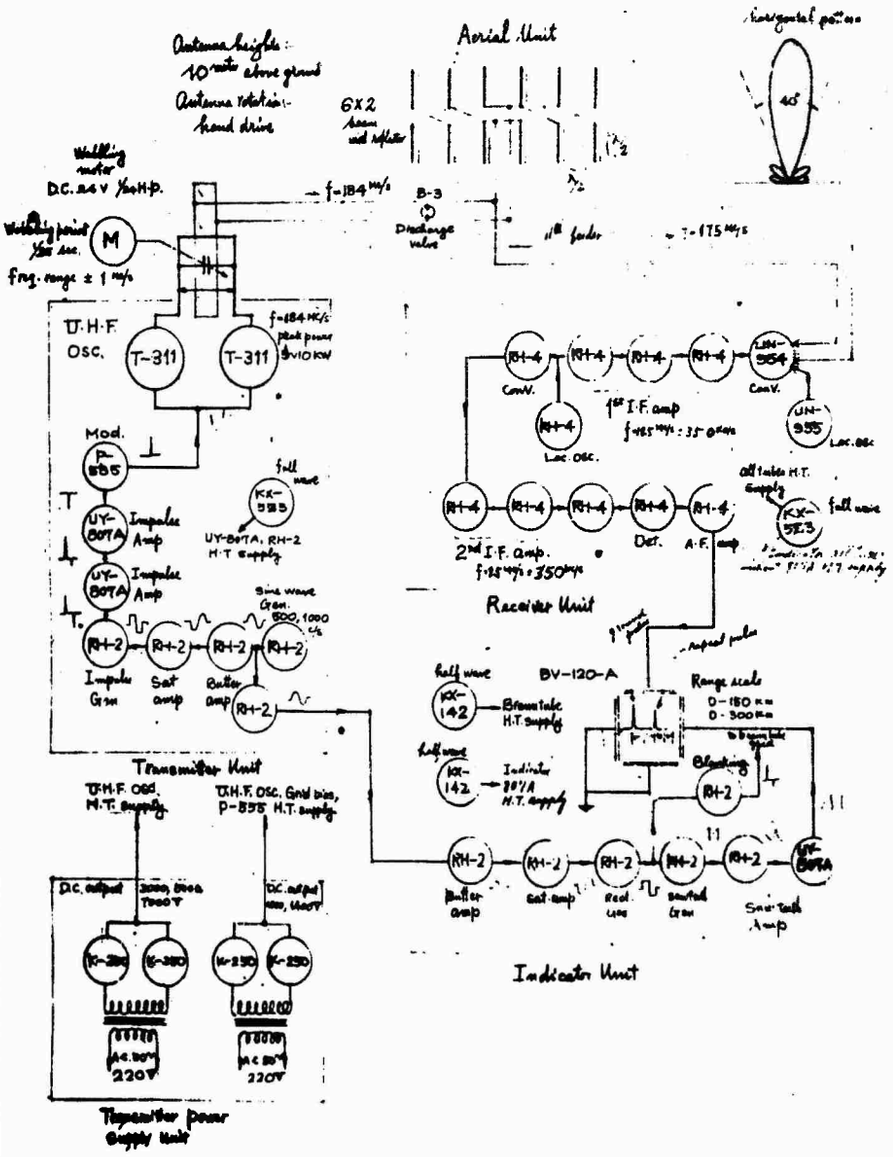
Tachi-17 Type I is a ground IFF interrogator to perform the same function as Tachi-13. Tachi-17, however, has a greatly increased antenna gain theoretically raising the maximum range from a figure of 150 km to 250 km.

The equipment was to have been installed in conjunction with strategic detector stations such as the Tachi-6. Modifications were already being made however in its design leading to the Model II.

Identification of Friend (on land post)

(Tachi-17-Type-2)

(manufactured by Mitsubishi Electric Co.



TACHI - 17 TYPE II

IDENTIFICATION OF FRIEND GROUND PART

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter f = 184 MC/S. 10 KW. Receiver f = 175 MC/S. Range 250 Km.
Accuracy: Range, ± 2 Km; Azimuth, ± 1°.

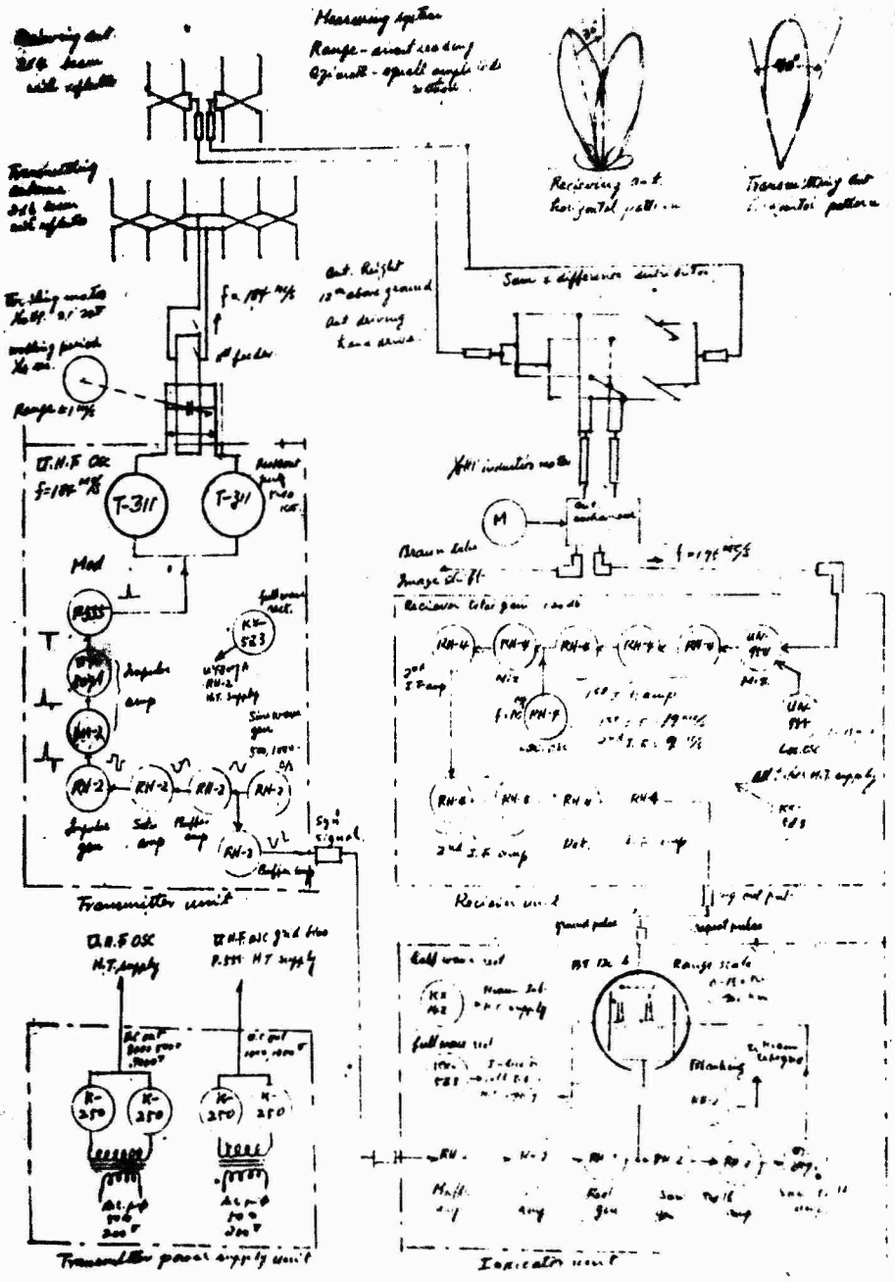
Number Built = *FEW* Number Installed = *UNDER TEST*

Description:

Tachi-17 Type II was developed from Type II, the principal difference being that lobe switching has been introduced in the receiving antenna system which is now distinct from the transmitting antenna. By this means the azimuth accuracy of the set is increased threefold. This feature was undergoing tests as the war ended.

Identification of friend (Mark-IV Type X)

(- One the land part) manufactured by Swastika Communication & Co



TAKI - 15 TYPE II

IDENTIFICATION OF FRIEND AIRCRAFT PART

Corresponding Allied Designation: ----

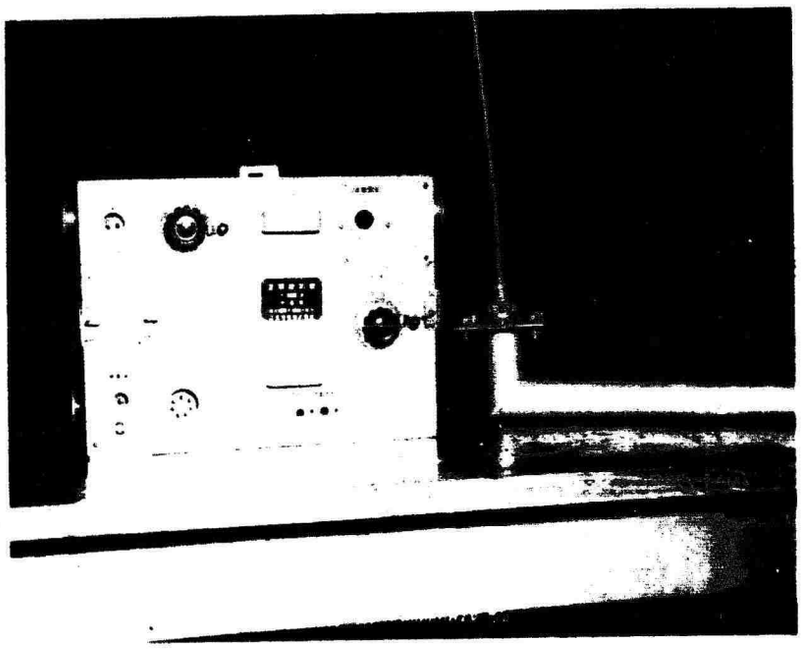
Technical Characteristics:

Transmitter f = 175 MC/S. 100 W. Receiver f = 184 MC/S. Non-directive.

Number Built = 120. Number Installed = Few, if any.

Description:

This is a considerably refined Taki-15 Type I transpondor equipment, using lecher rod tuning for the transmitter and a T-R tube to protect the receiver.

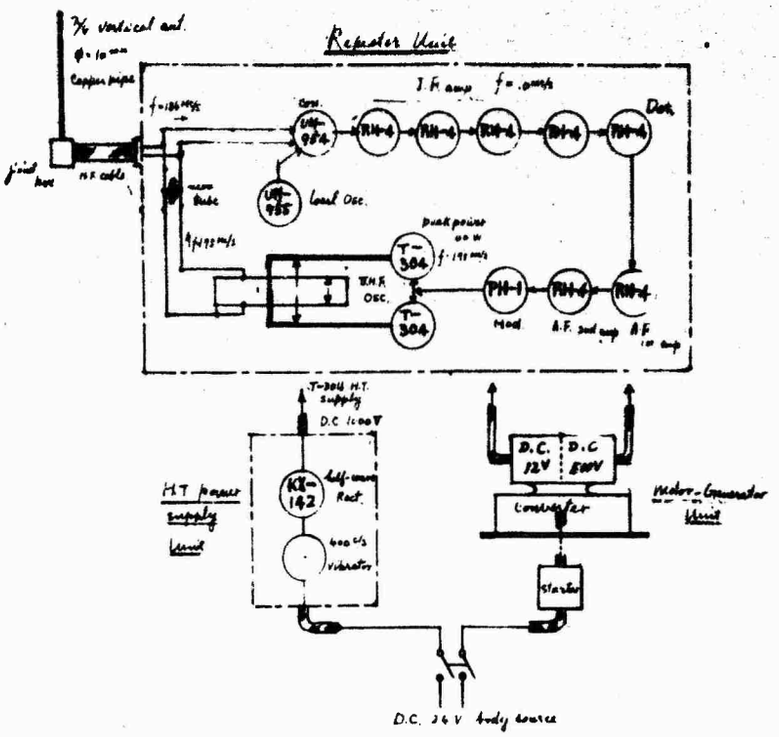


Army IFF Set, Taki-15, Type II.

Identification of Equipment (on aviation post)

(Repeater)

(Table 15 type E.) manufactured by Mitsubishi electric Co.



Interior View of Army IFF Set, Taki-15, Type II.

TACHI - 39

HYPERBOLIC NAVIGATION APPARATUS-GROUND PART

Corresponding Allied Designation: ----

Technical Characteristics:

f = 1.5 MC/S. 150 KW. Range during: day 900 Km; night 3000 Km. Range accuracy ± 1%.

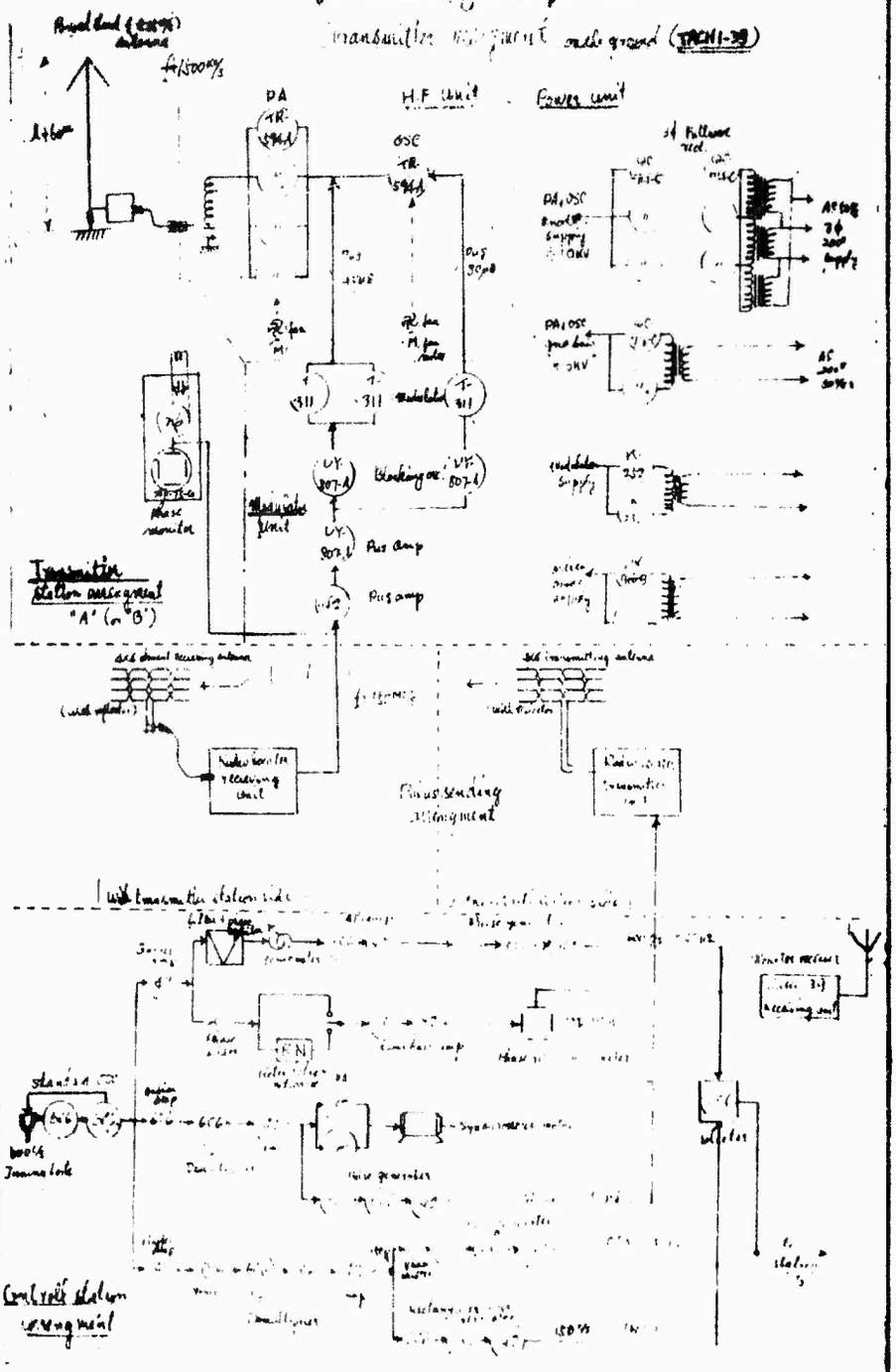
Number Built = First system partially completed, some destroyed by bombing.

Description:

Tachi-39 is the ground equipment for a hyperbolic navigation system similar to LORAN. Instead of having a "master" and a "slave" station, both stations in a pair are controlled over a 75 or 150 MC/S radio link by a separate master station which itself does not transmit pulses on low navigation frequency (1.5 MC/S). One station (station B) transmits a drift pulse as well as its regular pulse. The drift pulse moves at a carefully controlled rate, and the time between its coincidence with the A-signal and the B-signal (as viewed on the scope in the plane) is measured there with a stopwatch. This gives a quite accurate measure of the time by which regular pulse from B lags (or leads) the pulse from A, and hence establishes which hyperbola the airplane is on on the navigation chart. A similar fix from another pair of stations establishes the plane's location on another hyperbola. Where the two intersect is the plane's position.

This method is ingenious in that the stopwatch is the only time measuring equipment needed in the plane, and thus their airborne equipment can be much simpler than ours. The obtainable accuracy is probably not as good as that of LORAN. However, by careful control of main pulses, and the rate of the drift pulse a time difference of say 10 seconds might understandably be read to less than 1.0% error on a stopwatch, the claimed accuracy for the system.

Japanese army electronics engineers claim to have thought up the ideas themselves for Tachi-39 about August 1943. Several of the units for the first system had been built by the Sumitomo Company by the end of May 1945. A second set was made at the end of July but was destroyed by bombing on 2 August. This was to have been quite a formidable equipment, the total weight for a master and two slave stations coming to some 600 tons.


Hyperbolic navigation apparatus
PA
H.F. unit
Power unit
OSC
Transmitter station equipment
"A" (or "B")
Pulse sending equipment
Control station equipment

TAKI - 39

HYPERBOLIC NAVIGATION APPARATUS-AIRCRAFT PART

Corresponding Allied Designation: ----

Technical Characteristics:

f = 1.5 MC/S. Non-directive.

Number Built = A few models. Number Installed = Probably none.

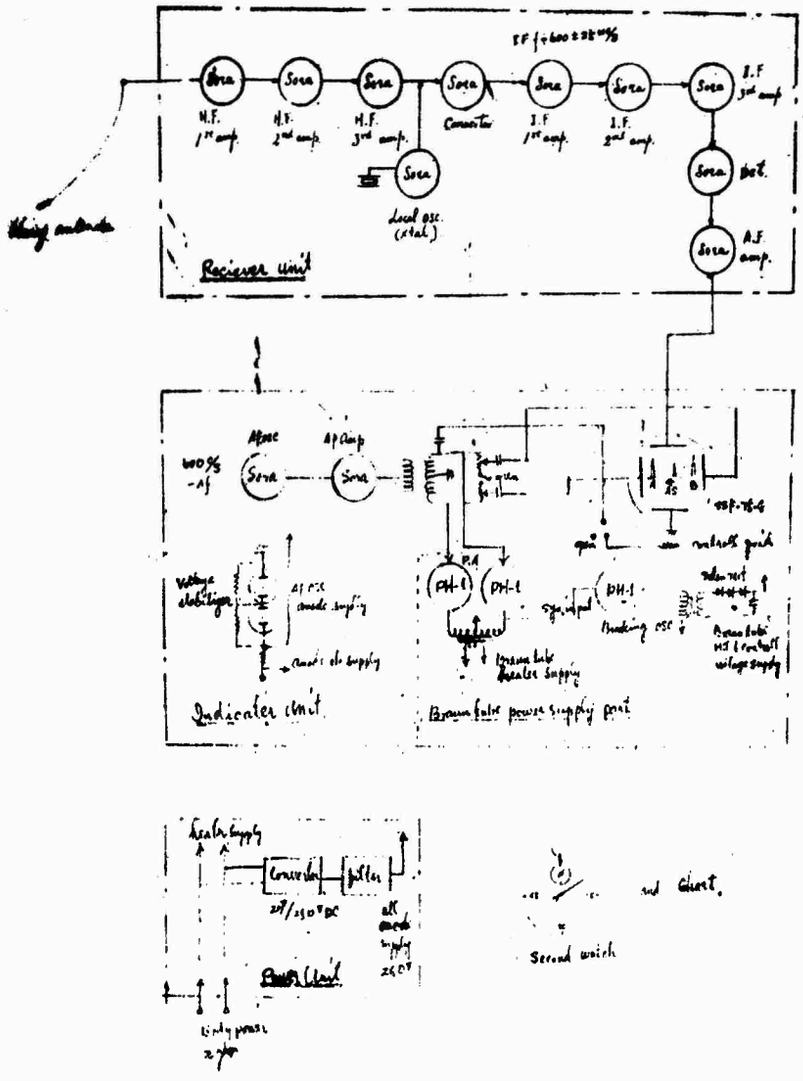
Description:

The airborne end of the hyperbolic navigation system consists of a simple superheterodyne receiver at 1.5 MC/S feeding the rectified r.f. pulses to the vertical deflection plates of an oscilloscope. The sweep is locally generated and is varied in rate until the received station pulses are held stationary. The time required for the drift pulse to walk from the A to the B pulse, or vice versa is read on a stopwatch; a chart then shows the line of position on which the aircraft must be located.

Hyperbolic navigation equipment

Aircraft receiver arrangement (TAKI-79)

① self-synchronous system



TAKI - 14

PATHFINDER

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 27 cm. 2 KW. Range in radius 20 Km (5000 M altitude). Accuracy: Range, ± 2 Km; Azimuth, ± 5°. PPI display.

Number Built = 2 or 3. Number Installed = 1.

Description:

Taki-14 was to have been the Japanese counterpart of the American SCR-717B, for use in navigation, search for ships, and possibly for bombing. It uses a grid modulated triode T-327 for transmitting which generates a pulsed power of 2 kw at 27 centimeters. The antenna is comprised of a clipped 60 cm parabola carrying a horizontal dipole and a 8 x 4 array of directors, which is claimed to give a beam 6° wide (half power point) and 60° deep in the vertical plane. The antenna which rotates at 20 rpm and has no tilting facility, is mounted in a paper fiber radome beneath the plane fuselage. A 120 mm cathode ray tube gives a PPI type of display. Rotary joint and hydrogen filled T-R tubes followed American practise. Circuit schematics of Taki-14 are given in Appendix II.

This set weighed much less than the corresponding microwave navy airborne search radar (120 kg vs 300 kg). Plans were being formulated to pool the joint army-navy experience in building a 5 cm airborne set to rival the American APQ-13.

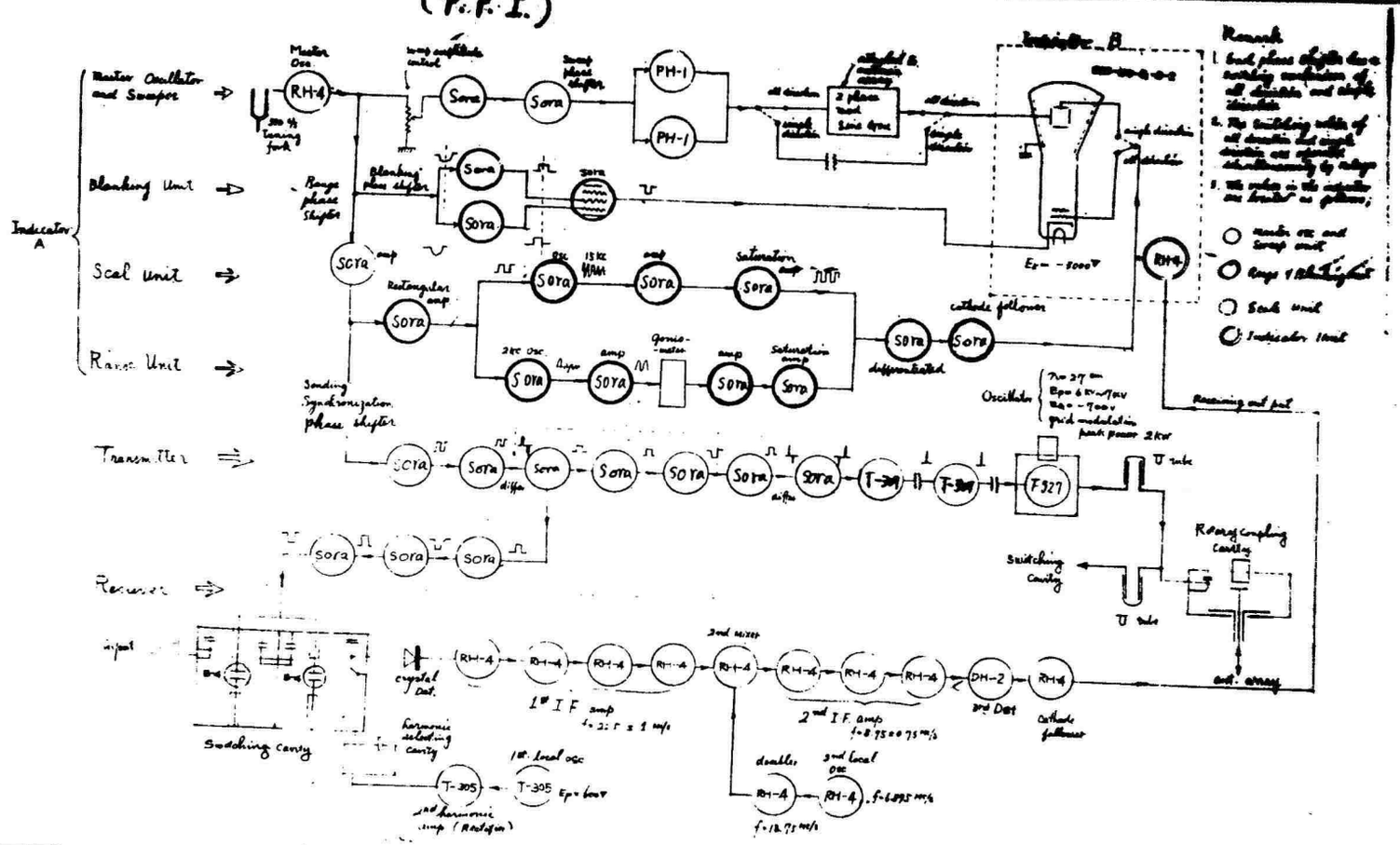
The first Taki-14 produced (by Tokyo Shibaura Electric Co.) was installed for test in a Ki-21 plane. Preliminary flights gave shore outlines at 30 km. The war ended while repairs were being made at Fusa airdrome to bomb damage inflicted on the plane.

Two models, I and II, were made of Taki-14. The second type differed chiefly from the first in that cavity tuning of r.f. circuits was used, and that the transmitter power was increased to 10 kw. This improvement nearly doubled the effective range to 70-80 km on large land masses.

The following recital of the development of Taki-14 was written by Maj. Uozumi, "project engineer" on the set for Tama Institute. It is given in full with the wording used on the original copy as an interesting view of the problems and difficulties confronting Japanese radar engineers in the later days of the war, as well as a review of their latest airborne radar construction.

Path finder ('Tobi 14)

(P.F.I.)



RESEARCH OUTLINES OF TAKI-14 (P.P.I.)

by Major Uozumi, Tama Research Institute

1. The starting time of research and the outlines of design. We started the research at the end of August in 1943. As we finished the collection of fundamental data for the set design, we started the trial production of Taki-14 at Toshiba-Tsushin Company according to the following data; i.e.

Transmitter:
- wave length = about 25 cm
- oscillator type = Back-coupling with cavity resonator
- modulation type = grid modulation
- peak output = 2-4 KW
- pulse width = 1.5 μs
- repeating frequency = 500 c/s

Receiver:
- Type = double superheterodyne
- 1st I.F. = 21.5 MC/S ± 1.5 MC/S
- 2nd I.F. = 8.75 MC/S ± 1.5 MC/S
- Sensitivity = about 110 db after the I.F. stage.

Antenna System:
1. Cooperation type of transceiving by the glim-relay method.
2. Yagi array with 3-dimensional parabolic reflector.

Weight:
- 120 kg excluding rectifier and inverter; rectifier = 40 kg.

2. The probable faculties expected of the set when we started the 1st trial production:

about 70-80 Km at unidirectional indication, and the most visible radius when we adopted the panoramatic indication is about 50 Km.

3. Process of Research.

We completed the No. 1 trial set on August in 1944, and then we tried the experimental flights aboard the Ki-21 (97 Type heavy bomber), but we found its faculties very poor and insufficient for practical use. That is to say, the most visible radius is about 25-30 Km only.

Thus we continued our efforts to improve mainly the antenna system and the feeder parts, and we succeeded to find a new wave-canal type antenna and low-loss contact of U type feeder.

On the base of the above mentioned improvement, we completed the No. 2 trial set at the beginning of February in 1945. We tried again the experimental flights. In this time the most-visible radius improved to about 40-50 Km, sometimes the reflection images of large objects, for instance, high mountains further than 50 Km, appeared. Thus we found the set practical at any rate though not so satisfactory.

Since then we have planned the production of 20 sets, calling them Taki-14 Type 1, and in parallel to the production we continued our research to improve the set more and more.

But the production company in Kawasaki has often been bombed and burnt until the nearly all parts of the sets on the way of production have been reduced to ashes completely except No. 3 trial set only.

In spite of the mortal damages we have planned the production again and again, even after August in 1945, but in vain until we met the end of War. On the other hand, we completed a experimental set in our laboratory, improving the transmitter output to above 10 Kw and the all high frequency circuits to cavity ones. We expected to call this type of set Type II.

The most visible radius of this experimental set attained certainly to about 70-80 Km. But, before the official trial production, the war ended.

Still more, we engaged with the fundamental research of 10 cm (Taki-24) and 5 cm (Taki-34) sets, and have had nearly complete design data except a powerful transmitter magnetron for 5 cm. They were different from Taki-14 only in the two points, i.e. the dimensions of high frequency circuits and the transmitter valves. But before the start of production, the war ended as similarly as above mentioned Type II of Taki-14.

4. The disposal of the sets that we had in our laboratory. As above mentioned the fact was that the war ended suddenly before the sets were applied for practical use, only finishing the experiments in laboratory. And the faculties of the trial set of Taki-14 at the end of the war as follows:

Most-visible radius is about 40-50 Km in Type I and about 70-80 Km in Type II. Well, on August 14th in this year, the war situation became too imminent to continue the research in laboratory even for our technical officers. We were obliged to prepare as we were able to go to the front to die--I dare say "to die".--

Thus at last we partialized and burnt down all our lovely sets--(Please pardon me to say "lovely") with all important documents of investigations or experiments, and then we suddenly met the end of War before we went to the front as you know. I'm very sorry as one engineer that we partialized and burnt down to ashes all the sets and technical documents. I can say with my responsibility that we have

never burnt our lovely sets if we knew the war would end on August 15th at once, and you american army or air forces would land such peacefully as we saw actually.

For the reason above mentioned, if we would like to find even the parts of Taki-14, we have probably a chance only at Toshiba-Tsushin Company, I think. But frankly speaking I doubt it because your bombs were too many and tremendous to residue something without reducing to ashes.

5. The circuit diagrams were written by the collection of the memories and random notes of my own, but I am convinced to be sure, correct. Type II is different from Type I only in the high frequency circuits and the oscillator, that is to say, in the former, the H.F. circuits were improved to completely cavity-type circuits, and its oscillator is push-pull.

TAKI - 11

ALTIMETER FOR HIGH ALTITUDE

Corresponding Allied Designation: -----

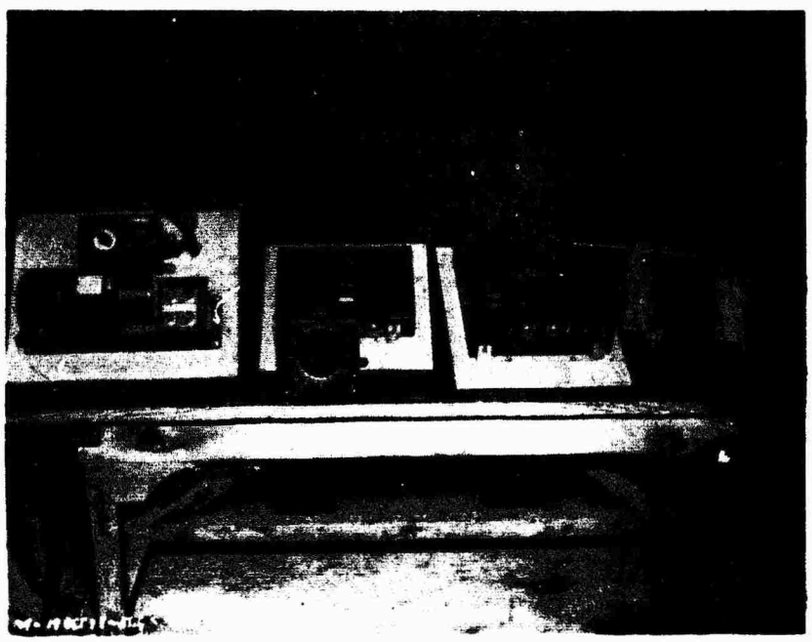
Technical Characteristics:

Wavelength = 80 cm. (f = 375 MC/S). 200 W. Range 12,000 - 200 M. Error ± 10%.

Number Built = ? Number Installed = Some in use.

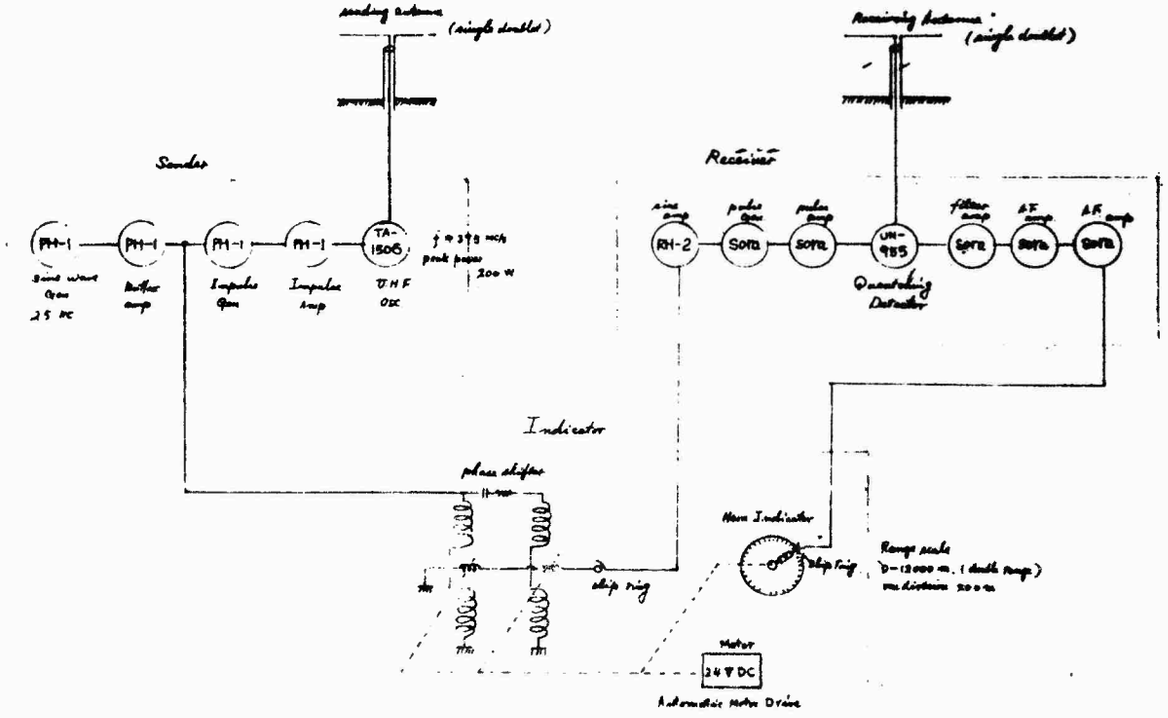
Description:

Taki-11 is a high altitude pulsed type absolute altimeter with a neon light indicator. Army electronics personnel agreed that it was a highly unreliable instrument.



Taki-11 High Altitude (Pulsed) Altimeter.

Altimeter for High altitude (Taki-11)



TAKI - 13

ALTIMETER FOR LOW ALTITUDE

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 80 cm (375 MC/S). Continuous power output 4 W. Frequency modulation 15 MC/S. Range 150 - 20 M. Error 5%.

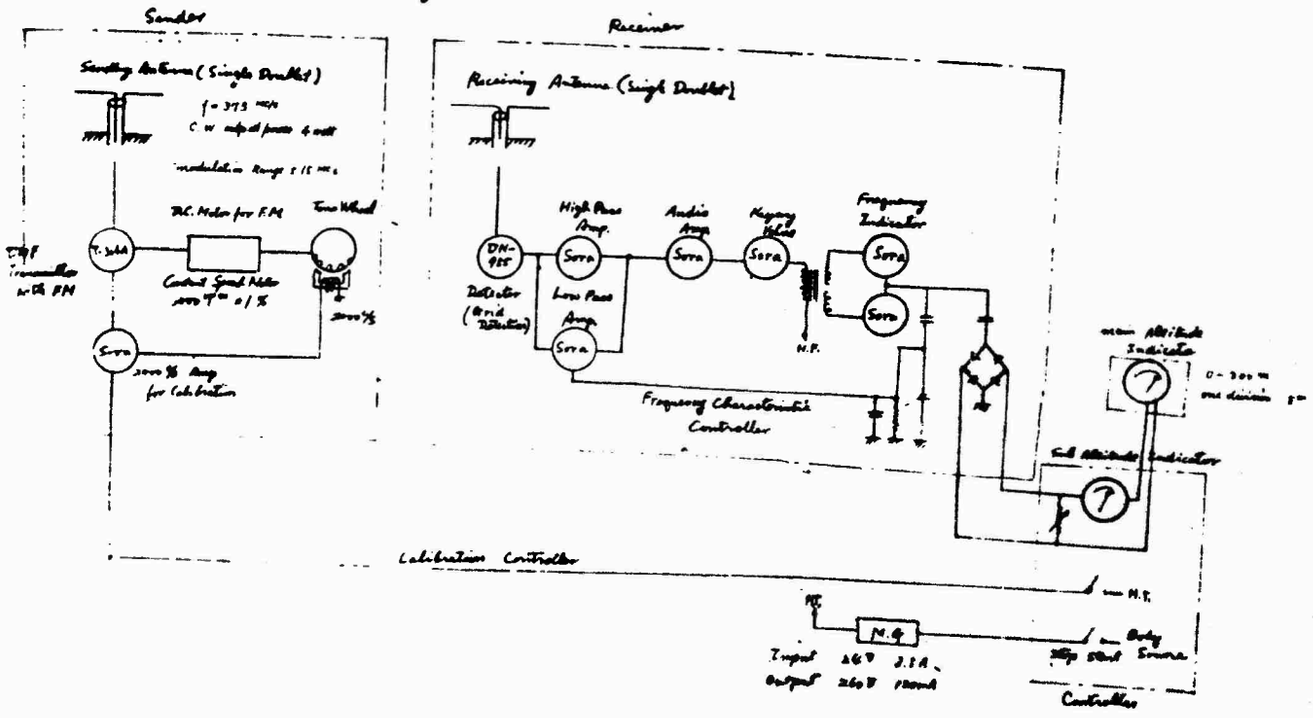
Number Built = 1000. Number Installed = Many in use.

Description:

Taki-13 is a frequency modulated CW low altitude altimeter corresponding to the American equipment AN/APN-1. The Japanese employed these, and so they claim, very successfully in their torpedo bombing attacks.

Altimeter for Low Altitude (Tobi No. 8)

Skelton Diagram



TAKI - 4

RECORDING WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

Technical Characteristics:

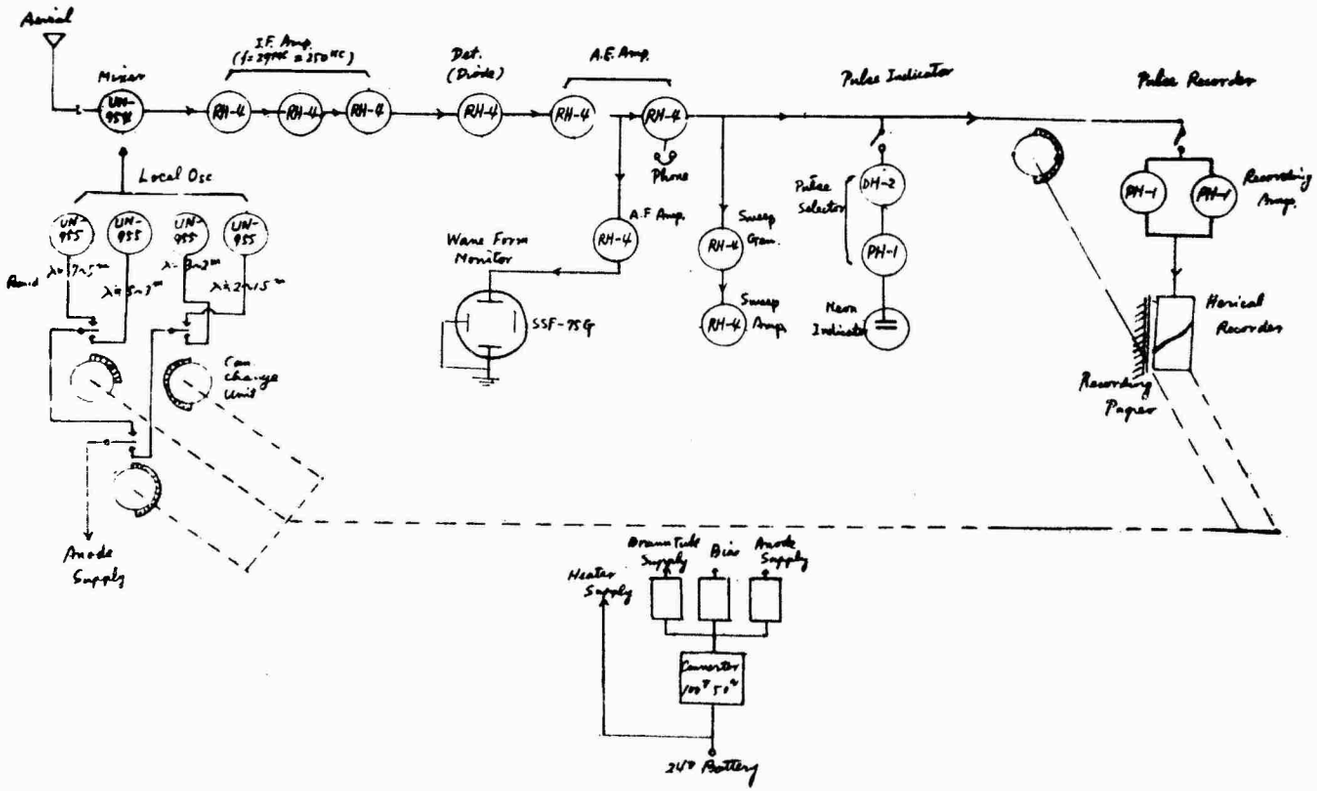
Wavelength = 7-1.5 M. Gain 100 db. Range 250 Km.
Accuracy of wavelength computation ± 1%.

Number Built = 10. Number Installed = 6.

Description:

Taki-4 is an RCM search receiver covering the range of 7 to 1.5 meters. The cam mechanism operating the local oscillator connections sweeps through the entire band in one second, and any signals picked up are marked on a helical spark tape recorder geared to the sweep mechanism which shows the time and wavelength of any signals received. A neon light flickers when any signals are being recorded. In alternate seconds the receiver is switched to a hand tuned local oscillator so that any spot of the frequency spectrum can be examined continuously. The signals in this case are switched to a variable sweep cathode ray tube on which the pulse form, width and repetition rate can be estimated.

Recording Wave Counter Measuring Apparatus (Taki — 4)



TAKI - 5

WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

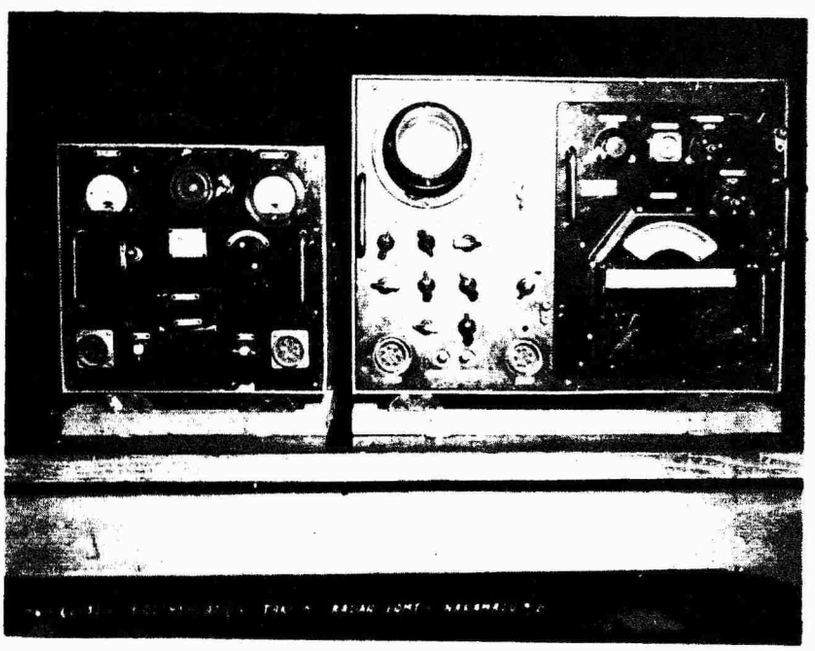
Technical Characteristics:

Wavelength = 4.5-1.6 M. Receiver gain 120 db. Range 300 Km. Accuracy of wavelength computation ± 1%. Accuracy of determining direction ± 5° at 200 Km.

Number Built = 30. Number Installed = Doubtful if any.

Description:

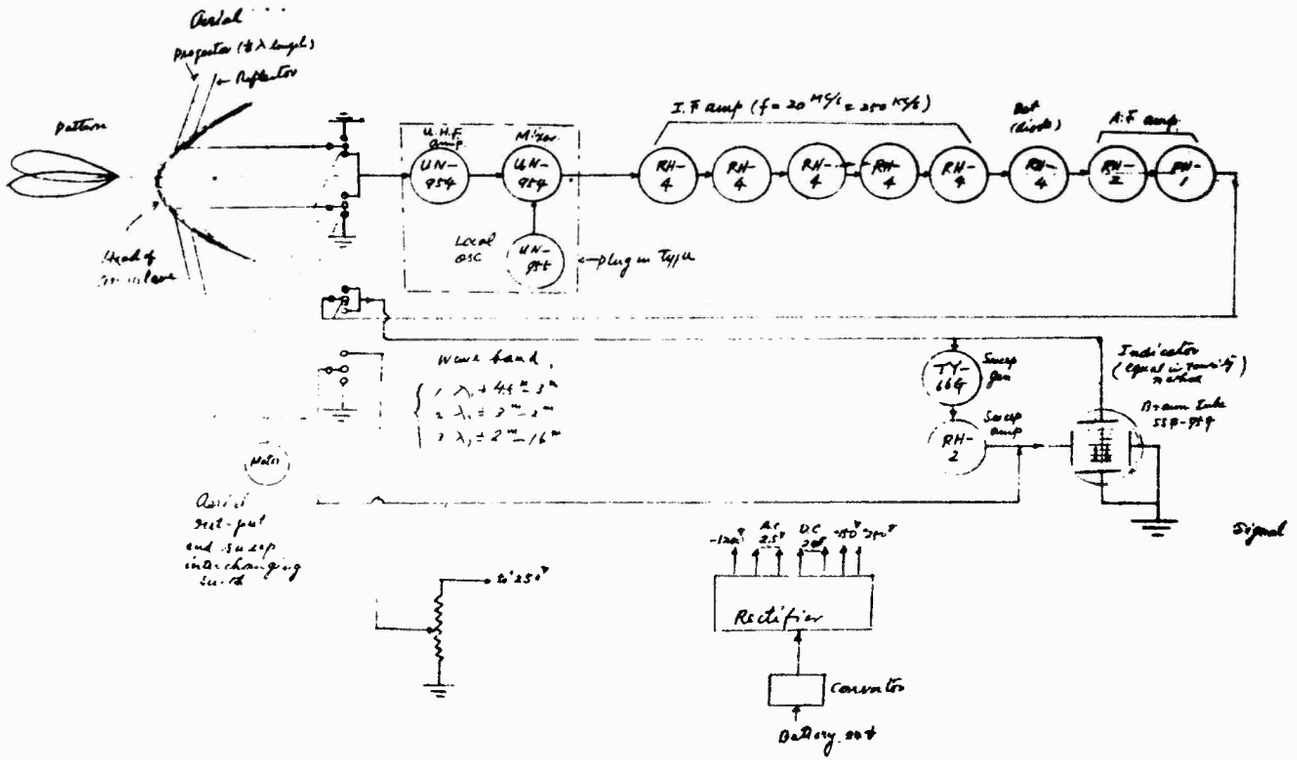
Taki-5 is a search receiver covering the 1.6 to 4.5 meter band, primarily designed for homing on intercepted signals. Azimuth is determined by lobe switching the receiving antenna pattern, and matching the resulting pip heights on a cathode ray tube.

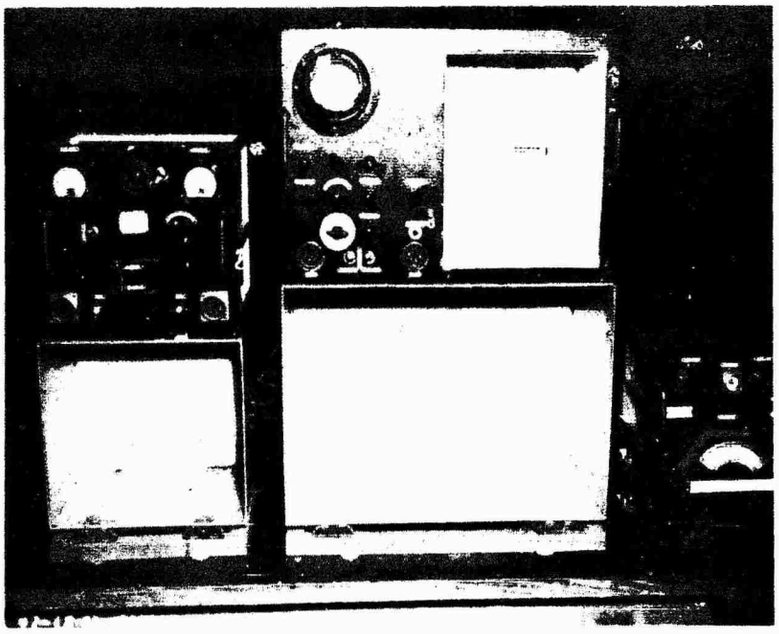


TAKI-5 Search Receiver with Plug In Tuning Units

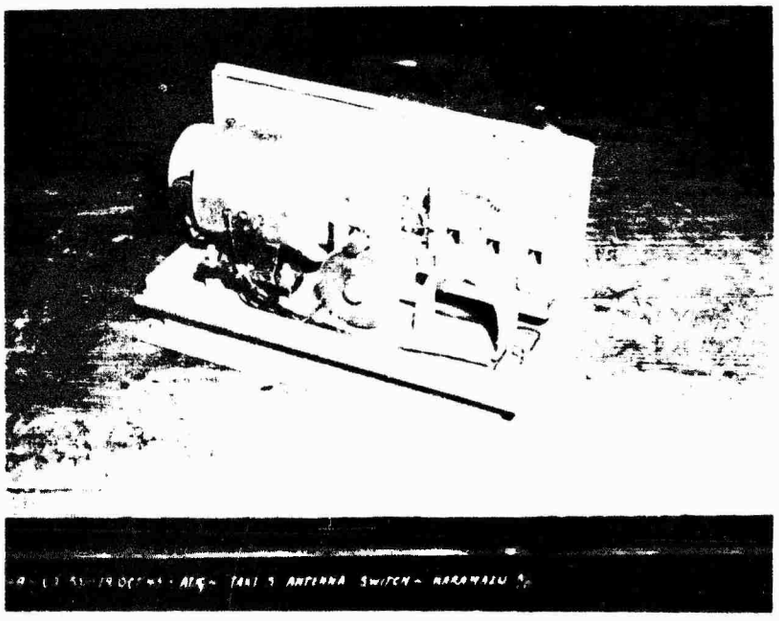
Wave Counter measuring apparatus (Table - 8)

(U.H.F Directive finder)





Taki-5 Search Receiver - with Tuning Unit Withdrawn.



Taki-5 Antenna Switch Detail.

TAKI - 6

SIMPLE WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: -----

Technical Characteristics:

Wavelength = 7. M-0.8 M. Gain 110 db. Range 300 Km.
Accuracy of wavelength computation ± 1%.

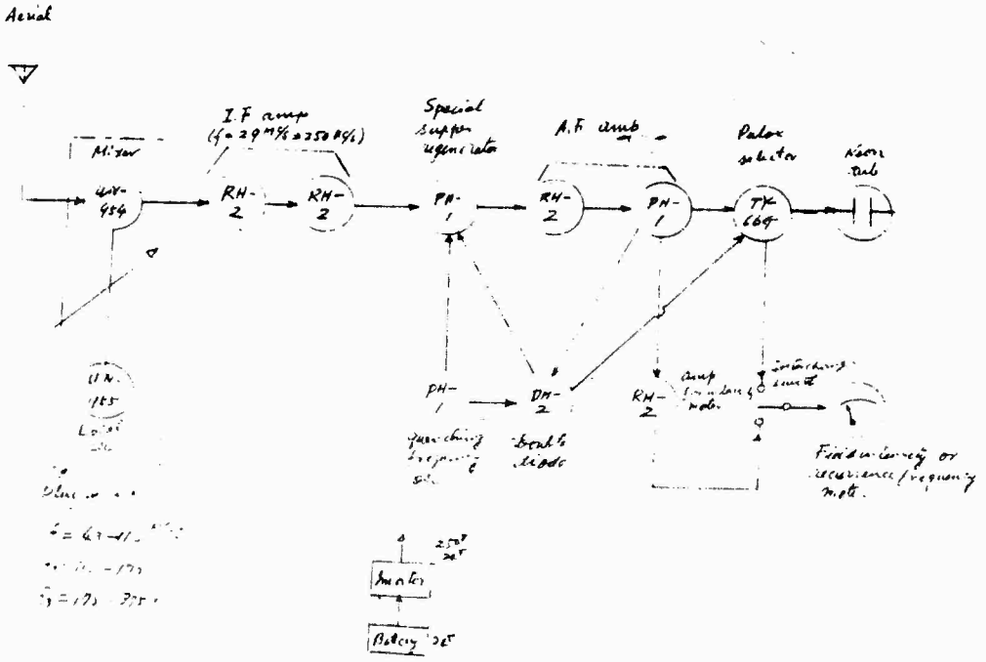
Number Built = 30 Number Installed = 6

Description:

This is a simple receiver tunable by hand over a range of 7 meters to 80 cm. Signal reception is noted on a neon tube. A meter reads averaged signal strength received, giving an estimate of the pulse repetition rate.

Simple wave counter measuring apparatus (Fig. 6)

wave band (7" - 85")



TACHI - 30

WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

Technical Characteristics:

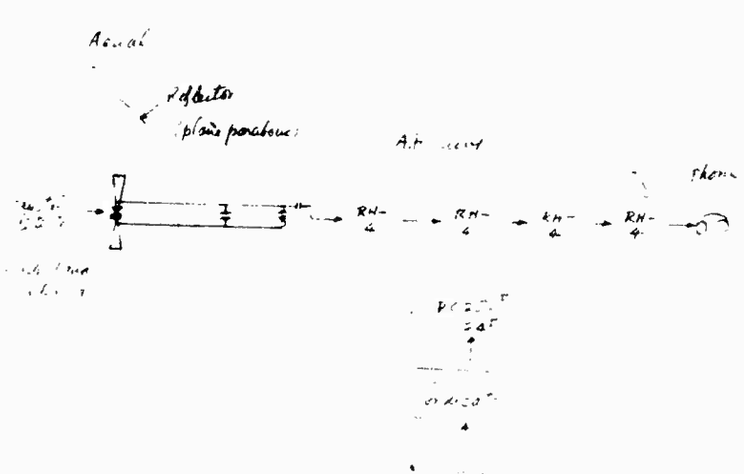
Wavelength = 70-3 cm. Gain 40 db. Crystal detector. Range 50 Km. Accuracy of direction $\pm$ 3°.

Number Built = 30. Number Installed = 2 used for Ground Observing.

Description:

This is an unusual RCM search receiver working in the centimeter range. A wide band dipole antenna is mounted at the focus of a parabolic reflector, and a crystal detector is associated with it by very short leads. A 4 stage audio amplifier brings up the signal loud enough to be heard in earphones.

Wave band (0.7t - 0.03")



TAKI - 8 AND TAKI - 23

WAVE DISTURBERS

Corresponding Allied Designations: ----

Technical Characteristics -- TAKI-8:

Wavelength = 7-1.5 M. Continuous 50 W. Impulse 500 W. Automatic or manual synchronizer.

TAKI-23:

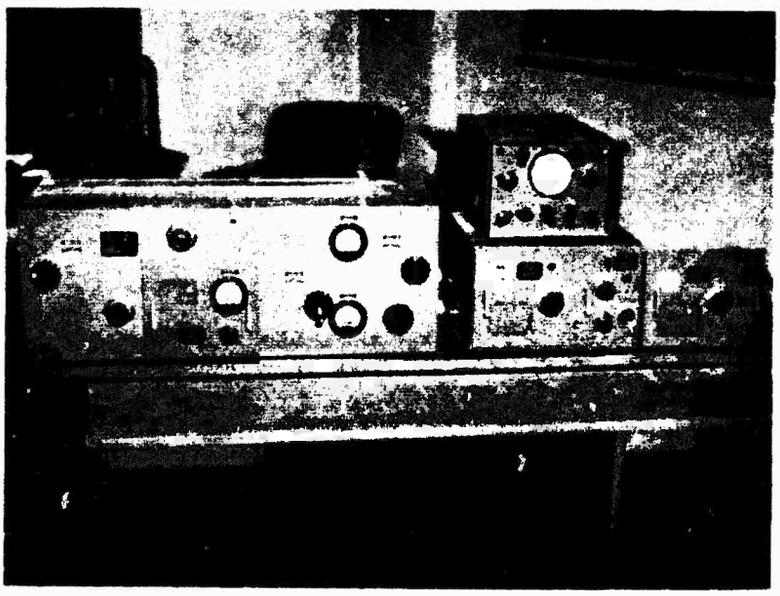
Wavelength = 1.5-0.8 M. Continuous 10 W. Impulse 200 W.

Number Built: Taki-8 = 10. Taki-23 = 5.

Number Installed = Taki-8 a few. = Taki 23 = 0.

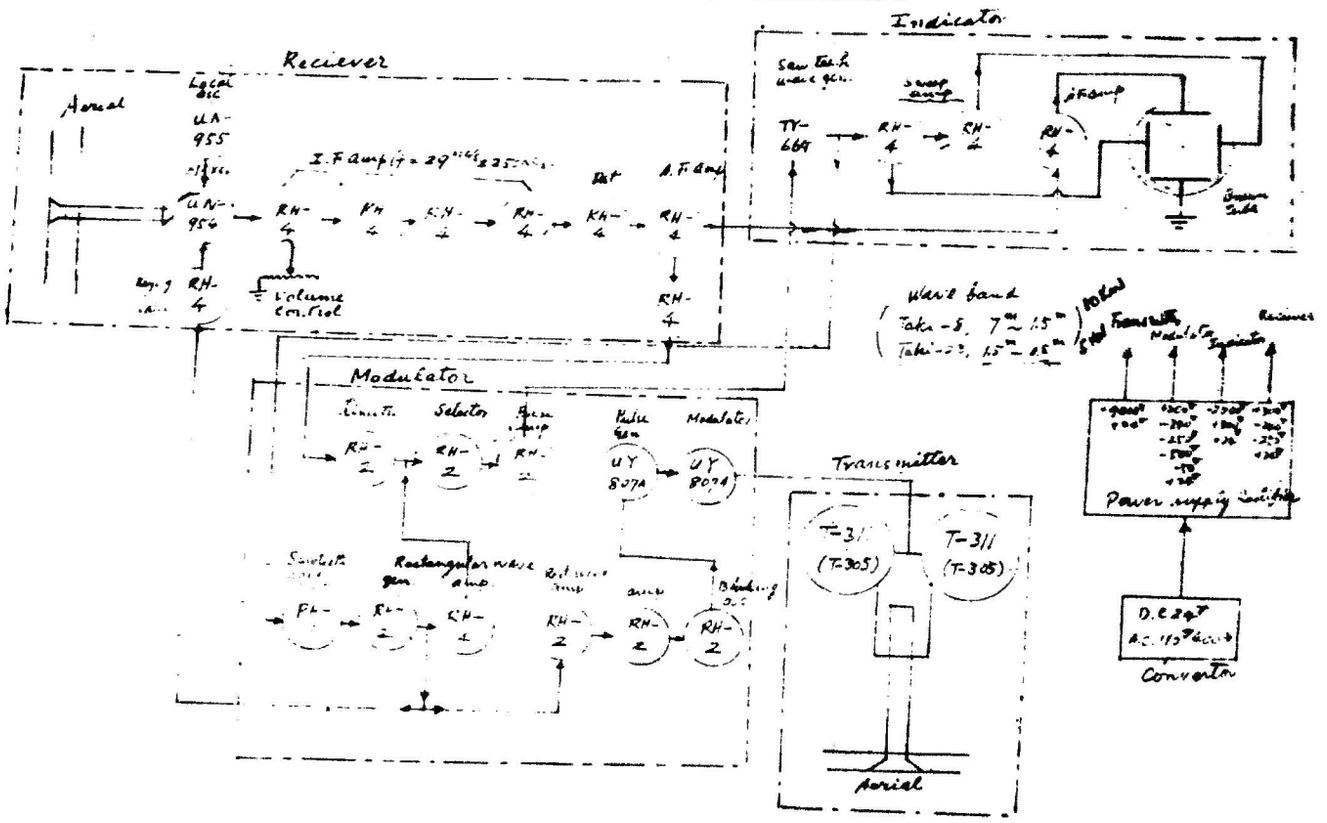
Description:

These are two spot jamming equipments covering the range from 80 cm to 7 meters. A receiver is so arranged that when a signal is found it may be amplified up and used to key the jamming transmitter. Although "spoofing" could have readily been arranged on these sets, there was no delay device built in them. The received signal may be viewed on a cathode ray tube. The jamming signal may be either pulsed or continuous; no arrangement is provided for viewing the received signal through the jammer's output when continuous wave transmission is being used. Horizontal dipoles with reflectors, one for receiving and one for transmitting, are located under opposite wings of the plane. Total weight of both sets: 210 lbs.



Taki-23 "Disturber"

Wave disturber (Taki-8 & Taki-23)



TACHI-35 A and B

MICROWAVE "DISTURBER"

Corresponding Allied Designation: ----

Technical Characteristics:

Tachi-35A: f = 350 to 1200 MC/S. 20 watts CW.
PRF: 2000-5000. Weight 800 lbs.

Tachi-35B: f = 10,000 MC/S.

Number Built: Tachi-35A, one experimental model built Decemb. 1944;
Tachi-35B, one under construction.

Description:

Both Tachi-35A and -35B were ground based jammer transmitters powered by magnetrons. Tachi-35B was especially designed to operate against American B-29 APQ-13 radars. The first model was scheduled to be completed by 15 September 1945.

TACHI - 200 AND TAKI - 200

INDUCEMENT OF SPECIAL FIGHTER

Corresponding Allied Designation: ----

Technical Characteristics:

f = 200 MC/S. Accuracy of direction ± 5°. Ground section partly modified version of Model 4 locator. Semi-automatic control or course indicator planned for aircraft component.

Number Built = 0. Number Installed = 0.

Description:

Tachi-200 (with Taki-200) is a proposal, with both pulsed and CW versions, for guiding a special high speed rocket fighter up a radar beam for the purpose of making interceptions. The transmitter of the pulsed system would be of the Tachi-31 type sending out a strong lobe with a circular orbit about the central pointing axis of the antenna. Superimposed on the transmission would be a synchronizing pulse to keep a rotating brush in the airborne receiver in step with the ground lobing. The strength of the lobe viewed in the plane in all four quadrants would be indicated on differential elevation and azimuth meters. By means of these, pilot is expected to "stay on the beam."

The aircraft for this job was supposed to have been built last March; but it was never available for experimental flight.

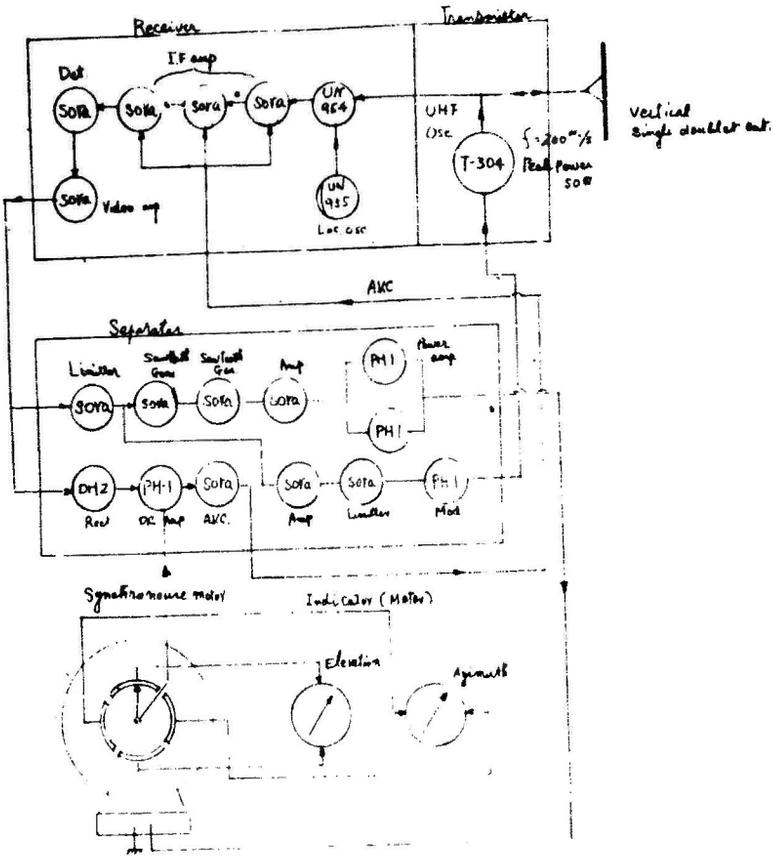
The C.W. system for guiding a "flighter" up a radar microwave beam, employed a scheme of switching lobes with different audio tone p.r.f.'s. These when heard by the pilot in the plane (or seen on a differential indicator) would tell him which move to make to get back in the center of the beam again. (This plan is not too dissimilar to one that was being flight tested as the war ended by 2d and 3d Operations Analysis Sections (Det), Thirteenth Air Force, in which close support bombers were to fly up an SCR-584 beam, the azimuth error signals received on the ground being translated to AN signals for the pilots guidance).

Instrument of Special flyter

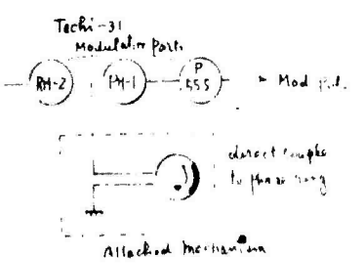
Impulse system

(Tachi – 200
Tachi – 300)

Tachi – 200



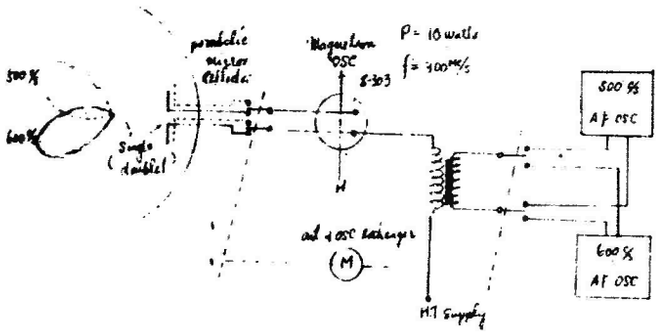
Tachi – 200 Some attached to (Radio Locator 'Improved type 4 (Tachi-31))



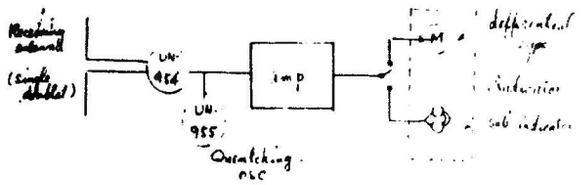
Instrument of special flights (Jaki 200 / Jaki 201)

(c w system)

Transmitter (Jaki 200)



Receiver (Jaki 200)



TASE - 100

AUTOMATIC ADHERING APPARATUS FOR BOAT

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 4.5-7.5 M. Effective distance 3 Km. Indicator of Taki Mk 5 omitted and auto control device attached.

Number Built = An experimental model only. Number Installed = 0.

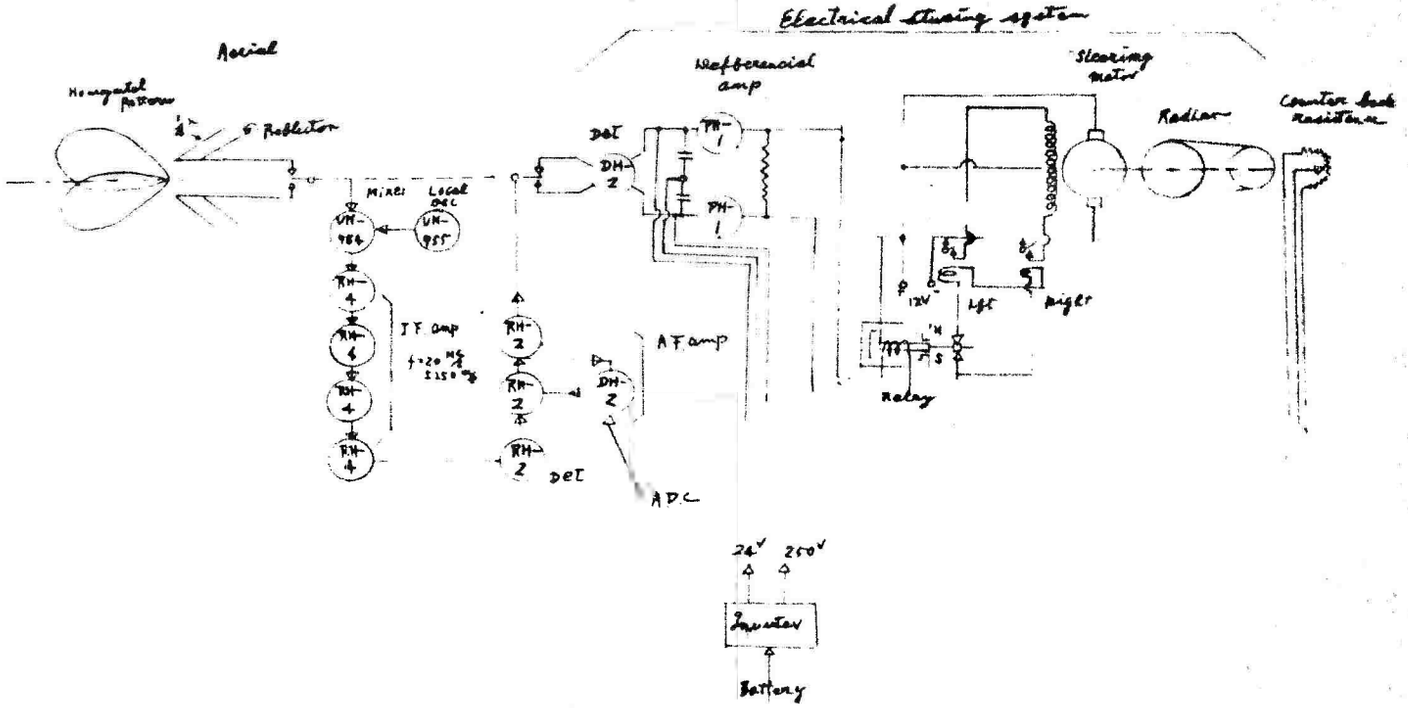
Description:

This device built around the Taki-5 homing search receiver was expected to be installed on explosive loaded motorboats to guide them automatically towards an enemy ship emitting radar signals in the prescribed band. A differential amplifier controlled by the relative strengths of received signals in the two azimuth lobes would operate a steering motor which in turn would keep the boat on a pursuit course toward the enemy ship.

Automatic guiding apparatus (Type-100)

(for boat)

wire bomb (45cm-14cm)



SUPPLEMENTARY

INFORMATION

DEPARTMENT OF THE AIR FORCE
AIR INTELLIGENCE AGENCY

AD-895892

MEMORANDUM FOR DTIC-BCR

ERRATA

17 January 1994

FROM: NAIC/MSIR
4115 Hebble Creek Rd Ste 14
Wright Patterson AFB OH 45433-5618

SUBJECT: Freedom of Information Act (FOIA) Request, Case I-FASTC 93-37

1. Reference your letter 22 December 1993 and 18 October 1993 NAIC letter, same subject.

2. NAIC OPR has reviewed documents AD 895891 Volume I, AD 895892 Volume II and AD 895893 Volume III and determined that the records are fully releasable.

3. The documents identified above may be released to future Freedom of Information Act requesters.

Marlyene A. Harrison

MARLYENE A. HARRISON, GS-11, USAF
Chief, Freedom of Information
Information Management Operations

ERRATA AD-895892

Attachment:
1. OPR Comments
2. Releasable Documents

DEPARTMENT OF THE AIR FORCE
AIR INTELLIGENCE AGENCY

[redacted] AD-895 892 [redacted]

MEMORANDUM FOR DTIC-BCR

ERRATA

17 January 1994

FROM: NAIC/MSIR
4115 Hebble Creek Rd Ste 14
Wright Patterson AFB OH 45433-5618

SUBJECT: Freedom of Information Act (FOIA) Request, Case I-FASTC 93-37

1. Reference your letter 22 December 1993 and 18 October 1993 NAIC letter, same subject.

2. NAIC OPR has reviewed documents [redacted] Volume I, AD 895892 Volume II and [redacted] and determined that the records are fully releasable.

3. The documents identified above may be released to future Freedom of Information Act requesters.

Marlyene A. Harrison

MARLYENE A. HARRISON, GS-11, USAF
Chief, Freedom of Information
Information Management Operations

ERRATA AD-895892

Attachment:
1. OPR Comments
2. Releasable Documents

DEPARTMENT OF THE AIR FORCE
AIR INTELLIGENCE AGENCY

MEMORANDUM FOR NAIC/DXL 6 January 1994

FROM: NAIC/MSIR

ERRATA

SUBJECT: Freedom of Information Act (FOIA) Request R-FASTC-93-37

1. The attached FOIA request is forwarded for your review and releasability.

2. It is regards to a previous request from Mr. Edward Kettler for paper copies of documents AD 895891 Volume 1, AD 895892 Volume 2 and AD 895893 Volume III entitled "A Short Survey of Japanese Radar." No documents were located in NAIC per telecon with DTIC, the request was forwarded to them. DTIC located the requested documents and has forwarded them to NAIC for review and release determination.

3. Please ensure the branch chief signs the 1st Ind and records the time expended on DD Form 2086. After completing the required actions on this request, please call extension 77236 for pickup.

ERRATA

JOHN A. MCGUIRE, MSgt, USAF
Asst Chief, Freedom of Information
Information Management Operations

3 Attachments
1. AD 895891 Volume 1
2. AD 895892 Volume 2
3. AD 895893 Volume 3

1st Ind, NAIC/DXLA DATE: 6 Jan 94

TO: NAIC/MSIR

1. The following apply:

__x__ Records are fully releasable.

Records should be:

____ Fully denied under: ____ Partially denied under:

Exemption: 1 2 3 4 5 6 7 8 9

2. Individual who worked this request/point of contact:

Name: Sherry Jennings
Office Symbol: DXLA
Phone number (black): 72435

3. Remarks:

ANITA L. MILLER, CHIEF
DOCUMENT REQUIREMENTS & ACQUISITION BRANCH